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Wisconsin Mills Report Successful Year

Heads of Nekoosa-Edwards, Consolidated Water Power and Ahdawaga Companies Comment On Business Situation and Outlook—Allen Abrams Elected Vice-President of Research by Marathon.

[FROM OUR REGULAR CORRESPONDENT]

APPLETON, Wis., December 30, 1940—Nekoosa-Edwards Paper Company, Port Edwards, Wis., is looking forward to the celebration of its seventy-fifth anniversary with a prosperous year in 1941. Operations have been at approximately 100 per cent of capacity in 1940, with the company becoming better established in the fine paper field.

Commenting upon the economic changes brought about by the war and defense, John E. Alexander, president of the company says:

"War overshadows everything of importance in this country. Here as well as abroad, it will affect such items as prices, business, volume of business, etc. When you put the whole war picture together you have a very strong business outlook with a possibility of upward trend in commodity price levels but not to the extent that it justifies the term 'inflation' up to where it is commonly understood with scare and fright in it.

Company Closing Successful Year

"Nekoosa-Edwards Paper Company must be dominated and controlled by these outside factors and to some extent we have had what might be considered now the closing of a very successful year.

"Within our organization we are now attempting to prepare for the future just as we have made preparations in the past. Next year (1941) will mark the seventy-fifth anniversary of this institution and throughout all these years we feel we have made progress, and decidedly so in the past few years, having embarked upon our program of diversification of product. We have permanently entrenched ourselves in the printing or white and fine paper field, building up a handsome merchant distribution and consumer demand. We have also diversified our products against southern competition by creating and merchandising specialty papers of many kinds and descriptions.

"In this march of progress, obviously we have improved our properties in every direction, not only through the personnel of the organization but the physical properties themselves. In this latter program we have made many new and substantial additions to our properties which have not only resulted in efficiency and reduction in manufacturing costs but, and that which is more important, improved the quality of our products.

"We have been especially fortunate during the past year in operating our mills at nearly one hundred per cent capacity and this has been beneficial not only for our employees but for the communities in which we live."

Allen Abrams Promoted by Marathon

Allen Abrams, technical director of the Marathon Paper Mills Company, Rothschild, Wis., was elected vice-president in charge of research by the board of directors at the annual meeting at the company's offices December 20.

Mr. Abrams and his associates have been responsible for the development of Parafilm, a transparent wrapping paper which now forms an important part of the company's annual business. One of its largest customers is the Kraft-Phenix Cheese Corporation, which wraps its processed cheese exclusively in Parafilm. The product also has extensive demand among other cheese manufacturers.

All of the other officers of the company were re-elected as follows: C. C. Yawkey, chairman of the board; D. Clark Everest, president; John Stevens, Jr. and Leo C. Croy, vice-presidents; Perry M. Wilson, secretary-treasurer; A. M. Van Douser, assistant secretary-treasurer, and F. P. Johnson, comptroller.

The stockholders elected as directors in addition to Messrs. Yawkey, Everest, Stevens, Wilson and Croy, the following: Ben Alexander, Lester Armour and M. P. McCullough, Chicago, Ill.; C. J. Winton, Jr., Minneapolis, Minn.; L. F. V. Drake and C. S. Gilbert, Wausau, Wis.

President Everest reported earnings of $3.47 per share for 1940 to the stockholders. He predicted the paper industry would share largely in the national defense program during 1941.

Consolidated Reports Good Year

Consolidated Water Power and Paper Company,

(Continued on page 25)

Business in Ontario in 1940 Best in Years

Although Newsprint Production Is Slightly Under 1937 Earnings Should Be Above Other Years — Paper and Pulp Industry Has Served As Sustaining Factor In Conflict — Other Industrial News.

[FROM OUR REGULAR CORRESPONDENT]

TORONTO, Ont., December 30, 1940—The paper market in Ontario closes this week one of the most satisfactory years in a decade. Output in some divisions has achieved new high figures. Newsprint production, which is a little less than the 1937 mark, is an exception. Revenue in the industry will probably be well above the figures for any other year on account of the premium on United States funds resulting from the sale of newsprint and pulp across the line.

Most plants in the industry have experienced a very satisfactory year, both as to production and revenue, even though there has been no great change in the price situation. The industry seems to have been working well in line with the government's efforts to maintain price stabilization in all industry, to prevent the usual war-time spiral which brings an inordinate rise in the cost of living. Ever since the conflict began the paper industry has kept prices under control and many items remain unchanged since 1939. Newsprint, the principal export item, is a case in point.

Paper and Pulp Sustaining Factor

The importance of the pulp and paper industry to the Canadian economy has been marked during the year just closing. The industry has been a potent influence in the great war effort being made. For instance, The Ontario Paper Company, Limited, is able to announce in a half-page advertisement in a financial paper, that more than 13 millions of dollars was made available through sales of this company alone, for the purchase of much-needed war equipment. The advertisement puts it this way:

"Canada's excess of exports over imports in 1939 was $173,859,570 (gold excluded). $157,454,661 of this favorable balance of trade was provided by exports of the pulp and paper industry. One-twelfth of this, or $13,767,226, worth of newsprint was supplied by Ontario Paper Company. This amount will buy and equip 135 bombing planes costing $100,000 each."

Figures for Ontario production are not available and will have to be extracted from the Canadian totals, which will not be available for some weeks yet. It is estimated, however, that the total production for all Canada this year will reach 3.5 million tons, which is generally conceded to be at least equal, if not greater, actually, than the record of 3,647,800 tons set in 1937, because in that year there was considerable advance buying. Ontario's share of this will be proportionately favorable.

Newsprint Output May Decline

Newsprint production for 1941, some authorities estimate, will be approximately 3.3 million tons, or 150,000 tons less than this year. Domestic consumption this year was 185,000 tons, which is about normal, and no increase in demand is anticipated. The overseas market has a carry-over from this year available for 1941 of 70,000 tons, which means a potential overseas market for both Canada and Newfoundland during the next twelve months of 200,000 tons.

The Latin-American market holds better prospects for Canadian mills in 1941. During the earlier part of this year considerable tonnage from Scandinavian countries was sold in Latin-America, but this will be almost entirely eliminated during 1941 if the war continues. It has been estimated that as much as 100,000 tons more might possibly be sold next year by Canadian and Newfoundland mills to the southern countries.

South Africa took considerable tonnage of Canadian newsprint during 1940 and although the publishers of our sister dominion have taken steps to control the use of newsprint, sales in that quarter should remain at about the same figure for another year.

There may be a slight drop in Australian and New Zealand requirements, while China, India, Far Eastern and other markets can not be expected, under present circumstances, to absorb more than the 90,000 tons sent them this year. The chief market, however, the United States, might even take more than the 2.6 millions of tons supplied by Canada this year.

There are a great many factors, however, that have to be taken into consideration in making a forecast of production for 1941. Such things as the availability of shipping space, shipping costs, insurance, advertising volume, government restriction on consumption and the duration of the war, must be considered.

If the United States market absorbs about the same amount next year as it did this year, the Canadian mills would appear to have, on all accounts, a potential market during 1941, some 100,000 to 150,000 tons below this year's figures.

In spite of the fact that costs of production have been creeping up and taxes have been raised, there is little likelihood of newsprint going above the $50 a ton set for the next six months.

Reserves accumulated in the United States by buyers of Canadian pulp because of the possibility of a shortage and the consequent advance in price, have been reduced to nearer normal proportions during recent months so that a steady normal demand may be expected during 1941. Sulphite and groundwood pulp is meeting with a steady demand from the United States, a demand which should continue. Any marked increase in that demand might push prices higher, so close is the demand running to supply. This condition applies more particularly to the bleached product.

Production of Fine Paper Satisfactory

Production in the fine papers division of the industry has been satisfactory in Ontario this year. Imports of certain types of fine papers and specialties have been eliminated or greatly reduced which has strengthened the position of Canadian mills.

Midwest Expects Upturn in Demand Soon

Fine Paper Sales Continue Relatively Slow But Marked Improvement Is Looked For Early Next Year—Kraft Paper Sales Continue Upward — Prices Weak In Many Lines — Other Market News.

[FROM OUR REGULAR CORRESPONDENT]

CHICAGO, Ill., December 30, 1940—Chicago paper houses are relatively quiet at this seasion of the year and 1940 is no exception. Reports indicate that the fine paper markets are still sluggish though there are many reasons for the conclusion that a marked upturn is in the near future. Inquiries are more plentiful and paper executives studying the situation are pointing to more widespread usage of direct mail and publications in 1941 as planned by general business.

Kraft papers continued the improvement begun a few weeks ago, reacting most favorably to the bettered consumer trend. Bonds and ledgers found only "hope" to buoy them over the inventory period while books and covers found similar encouragement in industrial and commercial appropriations indicating more direct mail volume in the coming year. Prices in most lines are not particularly stable, according to reports, and buyers are continuing to shop around in a somewhat uncertain market. Improved demand is expected to improve this situation next year.

Paper Men at Printers Guild Meeting

One of the most successful of a long series of December meetings was recently held by the Chicago North Side Printers Guild when, before a large and appreciative audience, three paper executives combined to discuss and illustrate humidity and its effects upon paper. Ted Johnson of the Oxford Paper Company showed a number of reels of motion pictures illustrating paper making while S. D. Dillon of the some company acted as the commentator for the unusually interesting movie. Arnold McAneny of Bradner Smith & Company was the guest speaker and to him was left the job of discussing humidity, its action upon paper in cold weather and methods to be used in lessening paper troubles in this respect.

Lou Gronich New Branch Manager

Friends of Lou Gronich, recently affiliated with the Chicago division of the Zellerbach Paper Company, have learned that he is to be the manager of the new branch of Bermingham & Prosser being established in Los Angeles under the name of the Dearborn Paper Company. Mr. Gronich was formerly manager of the General Paper Company of Los Angeles.

Salesmen's Party Makes History

The western division of the Salesmen's Association of the Paper Industry put on about the best Christmas party in its history on December 23 when a record crowd gathered at the Hotel Sherman to properly prepare for the advent of Santa Claus. Ben Babbitt again performed as master of ceremonies and he gathered around him a floor show which included dancers, songsters, magicians and entertainers of all sorts. As the piece de resistance the piano playing duo of Harold Pfister of Bradner Smith & Company and Harry Kerr, local insurance executive combined to give the proper musical background. John Diggs of Mosinee, president of the Salesmens national set up and Courtney Reeves of Allied Paper Mills, western vice president, were on hand to give the party added official dignity.

Harold Knott Visits Boston

Harold Knott, sales executive of the Wausau Paper Mills, is spending the holidays in the East. A part of the time will be spent at Mr. Knott's former home in Boston and a part of time in New York City.

N.P.T.A. Prize Winners Announced

A number of Illinois sales executives were awarded prizes during the National Paper Trade Association letter writing contest which just closed. The contest lasted for a period of eight weeks with prize winners selected for each week and with grand prizes awarded at the end of the entire contest period. The grand prize awards were given in reply as to the helpfulness of the N.P.T.A. contest while the weekly awards went to those who best answered questions which included "How do you use current rising prices as a factor in your selling", "How do you handle the customer who is very critical of your firm because of a mistake made by your company" and "How do you best answer the prospect who says 'Sorry, but I've decided to place the order with the Blank Company". Among the many Illinois winners listed in the contest which really attracted a lot of entries were W. G. Harbers, John C. Streibich Company, Peoria; A. F. Harder, Knox & Schneider, Chicago; Joe Herbst, John C. Striebich Company and W. S. Knox of Knox & Schneider.

New Consolidated Schedule

From Aurora, Illinois, comes a report from the Consolidated Paper Company plant in that city that an annual service bonus has been provided for employees along with an increase of five cents per hour at piece work.

Fine Paper Salesmen Plan for 1941

The Chicago Association of Fine Paper Salesmen has recently distributed a booklet telling of the purposes of the Association and listing quite a bit of personal data to further develop a feeling of friendliness and cooperation between fine paper salesmen of the city. For their December meeting, the Association collaborated with the Purchasing Agents Association of Chicago in a novel play showing the importance of the right kind of relationships between purchasing agents and sales executives. While the Association has attracted a membership from a number of leading fine paper houses, its officers feel that there are many other salesmen who should be affiliated and identified with the purpose of the organization which is to forward an interchange of ideas and in a mutual presentation of educational activities.

Obituary

Dr. Carleton E. Curran

Dr. Carleton E. Curran, 50, chief of the Forest Products Laboratory's pulp and paper division at Madison, Wis., died at a Rochester, Minn. hospital on December 23. Dr. Curran was well known throughout the pulp and paper industry. Funeral services were held at the First Congregational Church in Madison December 26.

Dr. Curran, who graduated from Wabash College in 1912 and received his Ph. D. from Ohio State in 1921, came to the Forest Products Laboratory in 1921 following service as a second lieutenant in the Chemical Warfare Service, and employment as abstracter in organic chemistry for Chemical Abstracts, and director of information for the Mead Research

Dr. Carleton E. Curran

Company. He retained an associate editorship with Chemical Abstracts to the time of his death.

Recognition of his abilities resulted in his advancement to chief of the pulp and paper division of the Forest Products Laboratory in 1930.

Dr. Curran was known to his associates in the Laboratory and to acquaintances in the pulp and paper industry as a thorough and brilliant scientist, an able executive, and an approachable coworker in the field of his specialization. Under his direction the work of the pulp and paper division on semi-chemical pulping of hardwoods, production of white papers and newsprint from southern pines, and improvements in the bleaching of pulp received wide recognition. He was the author of numerous publications on pulping and paper making processes which appeared widely in United States and Canadian journals and in reprints in foreign journals.

Aside from his interest in the field of cellulose and pulp paper, Dr. Curran was known to chemists for his interest in nomenclature. Outside the field of chemistry he was a keen student of the economics of forestry and forest products.

He was an active member of the American Chemical Society, the Technical Association of the Pulp and Paper Industry, and the American Society for Testing Materials. He was affiliated with Kappa Sigma and with Sigma Xi and Phi Lambda Upsilon, honorary scientific societies.

Dr. Curran is survived by his widow and a 17-year-old son, Carleton Junior.

Fred R. Davis

Fred R. Davis, advertising man, died at his home in Schenectady, N. Y. on December 26, after an illness of two years. He was 64 years old.

Mr. Davis was a founder of the Audit Bureau of Circulations and as an advertising space buyer for the General Electric Company for many years had supervised the expenditures of more than a million dollars annually for newspaper and magazine space.

He was born in Adams, Mass., attended Worcester Polytechnic Institute and received B. S. and M. S. degrees from Union College, Schenectady. While at college he was employed in the General Electric printing department in Boston and also in Schenectady.

In 1901 Mr. Davis joined the company as a test student and in 1902 went to Fort Wayne, Ind., as manager of the publicity department of the Fort Wayne Electric Company. In 1905 he returned to Schenectady as assistant to the advertising manager of the General Electric Company. As the department expanded he was given charge of most of the company's relations with publishers.

Mr. Davis served as a member of the board of directors of the audit bureau for twenty years and as third vice president, 1922-27, and first vice president, 1927-34.

Mr. Davis leaves a widow, the former Miss Ruth Reynolds of Buda, Ill.; a son, Robert E. of Forest Hills, L. I., and two brothers, William B. Davis of Forest Hills, L. I., and Ernest W. Davis of New York.

Joint TAPPI-Superintendents Meet in Kalamazoo

The sixth annual joint meeting of Kalamazoo Valley TAPPI and the Michigan Superintendents will be held at the Columbia Hotel, Kalamazoo, Mich. on Thursday, January 23rd at 6:30 P.M. Reservations should be made with Fred Elliott of the Kelly Ink Company. Kalamazoo. Only 350 can be accommodated and the attendance in the last few years has closely approached this number.

L. W. Sutherland of the Sutherland Paper Company will preside as toastmaster and the speaker of the evening will be Dunlap C. Clark, President of the American National Bank of Kalamazoo, who will discuss "Industrial Expansion Under the National Defense Program". He will stress, in particular, the relation between banking and industry as a means of accomplishing this expansion.

A. B. C. Drew, President of the Superintendents Association and R. G. Macdonald, Secretary-Treasurer will be present as well as a number of past presidents and executive committeeman of both national organizations.

Zellerbach Appointed Distributor

The Zellerbach Paper Company of Salt Lake City has been appointed distributor in that territory of Greylock linen ledger, the 85% new rag record paper manufactured by the L. L. Brown Paper Company.

FINANCIAL NEWS

New York Stock Exchange

High, Low and Last for Week Ending December 31, 1940

	High	Low	Last
A. P. W.	1¾	1¾	1¾
Armstrong Cork Co.	28⅞	27⅞	28¾
Celotex Corp.	7¼	6½	7
Celotex Corp., pf.	....	....	....
Certain-Teed Products Corp.	4½	4¼	4⅜
Certain-Teed Products Corp., pf.	35⅞	34½	35
Champion Paper & Fibre Co.	19½	18½	19⅛
Champion Paper & Fibre Co., pf.	104½	104½	104½
Congoleum-Nairn Co.	17½	16¾	17¾
Container Corp. of America	15½	14⅝	15⅜
Continental-Diamond Fibre Co.	7½	6⅞	7⅛
Crown-Zellerbach Co.	15¼	14½	14⅞
Crown-Zellerbach Co., pf.	91	90⅜	91
Flintkote Co.	15⅛	14¼	15
Robert Gair	2¼	2	2
Robert Gair, pf.	17¼	16½	16⅞
International Paper & Power	15⅜	14⅝	14¾
International Paper & Power, pf.	67	66	66½
Johns-Manville Corp.	61	56⅜	60¼
Johns-Manville Corp., pf.	....	....	....
Kimberly Clark Corp.	38¼	38¼	38¼
MacAndrews & Forbes	31	29½	29½
MacAndrews & Forbes, pf.	....	....	....
Masonite Corp.	28	26¾	27½
Mead Corp.	8¾	8	8¾
Mead Corp., pf.	....	....	....
Paraffine Companies, Inc.	34¼	32½	34⅞
Paraffine Companies, Inc., pf.	105¾	104	104
Rayonier, Inc.	17	16¼	17
Rayonier, Inc., pf.	28	27¼	28
Ruberoid Co.	16½	16¼	16⅜
Scott Paper Co.	34½	34⅛	34⅛
Scott Paper Co., pf.	....	....	....
Sutherland Paper Co.	23¾	21	23
Union Bag & Paper Corp.	12¾	11⅝	12¼
United Paperboard Co.	3⅜	3¼	3⅜
U. S. Gypsum Co.	66	61	66
U. S. Gypsum Co., pf.	....	....	....

New York Curb Exchange

High, Low and Last for Week Ending December 31, 1940

	High	Low	Last
American Box Board Co.	4½	4	4⅜
Brown Co., pf.	16½	15	15½
Great Northern Paper	41	41	41
Hummel-Ross Fibre Corp.	5⅞	5¾	5¾
National Container Corp.	10¾	10⅜	10¾
St. Regis Paper Co.	2½	2¼	2⅜
St. Regis Paper Co., pf.	80	78½	80
Taggart Corp.	3¼	3	3¼

Gair Files Plan

George E. Dyke, president of Robert Gair Co., announced that on December 21, 1940, the company presented to the Delaware Chancellor its application for approval of a plan of recapitalization designed to eliminate the arrears in preferred stock dividends, to correct the company's present unbalanced capitalization between the preferred and common stocks, to reduce the present disproportionate charge for annual interest and preferred stock dividend requirements to an aggregate amount more nearly commensurate with its earnings experience, and to eliminate the present preferred stock sinking fund required before declaration of common stock dividend.

The present preferred shares are entitled to $50 per share in the event of involuntary liquidation, and $52.50 per share in voluntary liquidation; to $3 per annum in dividends; and on December 31, 1940, there will have been accumulated dividends of $9.75 per share. The plan provides for the issue in lieu of each share of the present preferred stock and all unpaid accumulated dividends: $10.00 principal amount of Robert Gair Company, Inc. 40 Year 6% Income Notes due 1972 (or fractional scrip therefor for amounts less than $50); one share of new 6% cumulative preferred stock, $20 par value; three shares of common stock.

The new preferred shares will be of $20 par value and entitled to dividends at the rate of 6 per cent per share per annum, from January 1, 1941, and will be entitled to $20 per share in liquidation.

Upon consummation of the plan, income notes outstanding will be increased from $3,171,800 to $5,035,750, and the common shares from 574,646 to 1,133,822. The number of preferred shares (186,392) will be unchanged. The income notes and common stock to be issued will be a part of existing issues authorized but heretofore unissued.

The company has also filed with the Securities and Exchange Commission an application for the qualification under the Trust Indenture Act of 1939, of the trust indenture under which the income notes are issued.

No solicitation for proxies or approvals of the plan is being made at this time.

Chancellor William Watson Harrington has set January 21 for a hearing of stockholders on an application of the Robert Gair Company, Inc., to effect a recapitalization, according to an announcement from Wilmington, Del.

International Acquires Agar Co.

R. J. Cullen, president of International Paper Company and its subsidiary, Southern Kraft Corporation, last year announced that International Paper Company has acquired the entire stock of Agar Manufacturing Corporation, producers of corrugated kraft shipping containers. The Agar company has a present capacity of 150,000 tons of shipping containers yearly in plants at Whippany, N. J.; Somerville, Mass.; Chicago, Ill., and Kansas City, Kans.

Agar Manufacturing Corporation has for years been Southern Kraft's largest customer for kraft liner board and corrugating material and recently has been purchasing its entire requirements of these products from Southern Kraft Corporation.

Agar Manufacturing Corporation will be operated as a subsidiary of the International Paper Company by the present Agar staff under the continued direction of Calvin A. Agar as president, who has built the business to its present size—one of the largest in the industry. Mr. Agar will also become a director and vice-president of International Paper and Power Company.

Carey Declares Dividend

The Philip Carey Manufacturing Company has declared a dividend of 10 cents, payable December 28 to common stockholders of record December 24. Dividend resumed, 15 cents paid on December 27, 1937.

Nashua Pays Extra Dividend

The Nashua Gummed and Coated Paper Company has declared an extra dividend of $2.50, payable December 26 to common stockholders of record December 23.

CONSTRUCTION NEWS

Green Bay, Wis.—The Fort Howard Paper Company, manufacturer of bristol, tissue and other paper stocks, has plans maturing for construction of addition to turbine station, including installation of equipment for increased capacity. Work is scheduled to be carried out early in 1941. No estimate of cost announced. Harry W. Williams, Northern Building, Green Bay, is architect.

Kansas City, Mo.—Erection is being placed under way on new one-story building at Fourteenth and Clays streets, North Kansas City, to be occupied by the Graham Paper Company, 332 West Sixth street, commercial paper products, for storage and distribution. As previously announced in these columns, the new structure, totaling about 40,000 square feet of floor space, will be leased from the North Kansas City Development Company, Railway Exchange Building, owner. General erection will be carried out by the Hiram Elliott Construction Company, 912 Baltimore avenue, Kansas City, and miscellaneous contracts are being let for plumbing and heating, painting, and other finishing work. New unit is reported to cost over $50,000, with equipment, and will provide large increase in present facilities.

Los Angeles, Cal.—The United States Envelope Company, Springfield, Mass., manufacturer of commercial and other envelopes, paper cups and other paper products, has approved plans for new paper-converting plant at 2828 East Twelfth street, Los Angeles, where tract of land has been acquired. It will be one-story, sawtooth roof-tye, about 115x190 feet, and will be equipped for large capacity. It is reported to cost over $80,000, with equipment. An award for design and erection has been made to the Austin Company, 777 East Washington boulevard, Los Angeles, and 16112 Euclid avenue, Cleveland, Ohio, engineer and contractor, and work is scheduled to begin at once. New plant will be operated as the Los Angeles Division, and will supplement present Pacific Coast plant of the company at 400 Second street, San Francisco, operated as the Pacific Coast Envelope Company Division.

Elizabeth, N. J.—Peter J. Schweitzer, Inc., 994 Newark avenue, manufacturer of bond, cigarette and allied paper stocks, has completed plans for a new building at its plant, consisting of a one-story unit, about 30x100 feet, to be used primarily for storage and distributoin. General erection contract has been awarded to the D'Elia Building Company, 2761 Hudson boulevard, Jersey City, N. J., and work will be placed under way at once. Cost is estimated close to $50,000, with equipment. H. K. Smith, 36 Sherman place, Jersey City, is architect. This is part of the expansion program under way at the mill for a number of months past previously referred to in these columns, to represent a large investment.

Los Angeles, Cal.—The Pioneer Flintkote Company, 5500 South Alameda street, Vernon, Los Angeles, manufacturer of roofiing papers, building papers and kindred stocks, has taken out a permit for erection of new one-story addition to mill, about 32x45 feet, reported to cost over $20,000, with equipment. Superstructure will be placed under way at once.

Peshtigo, Wis.—The Badger Paper Mills, Inc., manufacturer of tissue and kindred paper stocks, waxed and other processed papers, has work nearing completion on two-story addition to mill, about 130x210 feet, previously referred to in these columns, and will have the structure ready for occupancy early in 1941. It is reported to cost over $100,000, including equipment. It will be used for general expansion in production division. Erection is being carried out by the Edward H. Meyer Construction Company, 75 Main street, Oshkosh, Wis.

Monroe, Mich.—The River Raisin Paper Company, Inc., manufacturers of paper board products, straw board, corrugated fibre containers, etc., is running on a high production schedule, with all mill units in service, giving employment to a large working force. Similar activity is current at branch mills at Cleveland, Ohio, and Washington, Pa.

Marrero, La.—The Celotex Corporation, Marrero, near New Orleans, manufacturer of insulating board, wall board and allied products, will begin work early in 1941 on new addition to local mill, recently noted in these columns, consisting of a one-story structure, about 190x300 feet, for storage, distribution and other operating service. It is reported to cost about $140,000, with equipment, and will provide for large increased facilities. An award for a sprinkler system installation has been made to the Globe Automatic Sprinkler Company, Maritime Building, New Orleans. Contract for building erection will be placed at once. George H. Burt is company engineer in charge. Main offices are at 919 North Michigan avenue, Chicago, Ill.

St. John, Que.—The Kraft Paper Products, Ltd., 83 Richelieu street, manufacturer of kraft paper goods, has begun erection of new one-story addition to mill, for general use in production division, reported to cost in excess of $50,000, including equipment. Structure will be pushed to early completion.

Bathurst, N. B.—The Bathurst Power and Paper Company, manufacturer of kraft liner stocks, paper board and kindred specialties, is operating on an increased production schedule at local mills, with incoming orders assuring continuance of present operations for some weeks to come. All mill departments of the paper and board mills, respectively, are in service, with regular working quota.

NEW COMPANIES

New York, N. Y.—The Surplus Paper Stock Corporation has been incorporated with capital of 100 shares of preferred stock, and 100 shares of common stock, no par value, to deal in paper products of various kinds. New company is represented by Philip Adler, 8 West Fortiest street, attorney.

Garfield, N. J.—The Empire Specialty Board Corporation has been incorporated with capital of 100 shares of stock, no par value, to manufacture paper board products. It is proposed to operate a mill in this vicinity. New company is represented by Charles W. Rosenmertz, Passaic, N. J.

Instrumentation Studies. XXXVII*

A Study of Photoelectric Instruments for the Measurements of Color: Reflectance and Transmittance

Part VI: The Higgins Reflection Meter[1]

By The Staff of The Institute of Paper Chemistry

Abstract

Descriptions of the optical and electrical systems of the Higgins reflection meter are given. The spectral, photometrical, geometrical, and operating features of the instrument are discussed.

The principal cause for change in spectral characteristics with time was tarnishing of the spotlight reflectors. Errors due to infrared response of the photocell are negligible. The reflectance scale was found to read low by a maximum value of 0.7 point at 50% reflectance. A large area of sample is illuminated at 45 degrees and viewed at 90 degrees with its surface. Readings are independent of orientation of the specimen in the sample opening. A comparison of the Higgins reflectance (Wratten filter 49) and the G. E. reflection meter "brightness" values for 50 papers indicate fair agreement under the stated conditions. The Higgins values are generally higher, with a maximum difference of 1.1 points.

The Higgins reflection meter is an abridged spectrophotometer, designed for use as a control instrument for the measurements of brightness (as defined by measurement with the G. E. reflection meter) and opacity. In view of its claims to be used as a control instrument for the measurement of brightness, the requirements are not nearly so rigid as would be those for an instrument designed to replace the G. E. reflection meter. Consequently, the discussion will proceed along two main lines. First, the spectral, geometrical, and photometrical features of the instrument will be discussed in a manner similar to that used in previous instrumentation studies.

* This report is one of a series issued as a part of the instrumentation program of the American Paper and Pulp Association.

[1] Part V of this series appeared in Paper Trade Journal 107, no. 25:29-40 (Dec. 22, 1938).

[2] Transmits a narrow band of wavelengths.

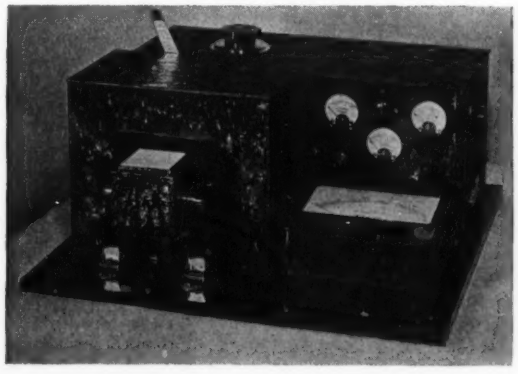


FIG. 1.
Higgins Reflection Meter

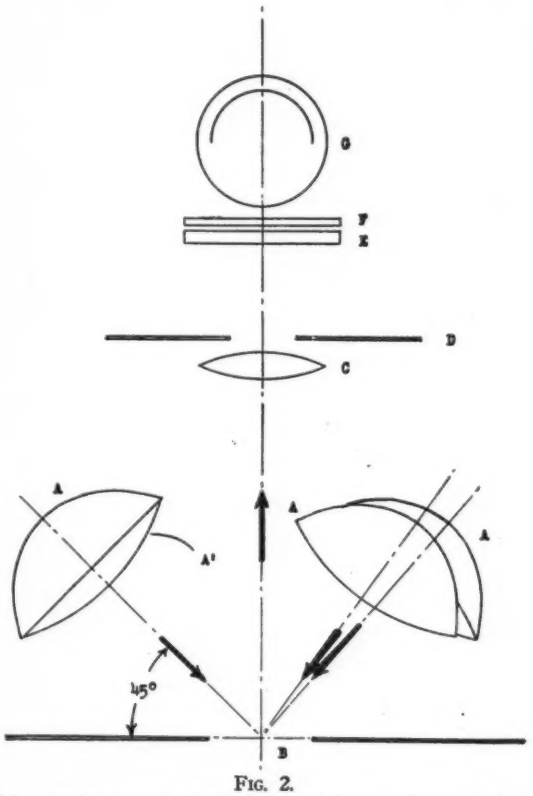


FIG. 2.
Schematic Diagram of Optical System of Higgins Reflection Meter

Second, this discussion will be interpreted in the light of the use of the instrument for control.

The material presented in Instrumentation Studies XX (*1*) will be referred to in order to eliminate repetition, and consequently it will be well for the reader to have a copy of that report at hand.

Description of the Instrument

A photograph of the Higgins reflection meter is reproduced in Fig. 1 and a schematic diagram of the optical system is given in Fig. 2. The source of light used in the Higgins reflection meter consists of three spotlights arranged on a circle so that they illuminate the sample at roughly an angle of 45 degrees. A 15-candle power 6-8-volt lamp is used in each reflector, and a ground watch glass which serves to diffuse the light is placed over the reflector. The sample holder consists of a hollow metal box mounted on a spring hinge so that a sample may be easily placed in position for reflectance measurements and at the same

time be rigidly clamped. A white Carrara glass standard is mounted on the box and is used as the working standard of reflectance. One face of the box is open and the inside is lined with black velvet, thereby producing a black cavity of practically zero per cent reflectance.

Operation

The light reflected from the sample in a direction practically perpendicular to its surface is received by a condensing lens and is focused on the active surface of the phototube. Before reaching the phototube, the light passes through a stenochromatic[2] filter and a Corning Aklo infrared-stopping filter. The phototube is a G-M Visitron cell no. 71-D. The photocurrent produced by this tube due to the light reflected from the sample is then amplified by a one-stage amplifier which employs a type 36 tube. The plate current of this tube is balanced out of the meter by means of an auxiliary circuit which uses a 1.5-volt dry cell and a rheostat. A Weston galvanometer, zero to 100 μa * full scale deflection, is connected so that it measures the difference in the plate current of the amplifier tube corresponding to the difference in the photocurrent produced by reflection from the sample. The lamps are energized by a six-volt storage battery and are ordinarily operated at 5.7 volts; the same battery supplies the filament of the amplifier tube. B-batteries supplying electromotive forces up to 135 volts are required to provide the voltages on the screen grid and plate of the amplifier tube. As will be discussed later in the section on the operating characteristics of the instrument, it is necessary that these voltages remain extremely constant during the time required to perform a measurement.

The adjustments to be made in the operation of the instrument are as follows: the batteries are connected to the respective terminals; the voltages at the lamps, the screen grid, and plate potentials of the amplifier tube are measured by means of the two voltmeters provided. The plate current of the 36 tube is adjusted to 1.75 ma. by varying the filament current. The black cavity is then put into place over the sample opening and the desired stenochromatic filter is placed in the beam. The current indicated by the microammeter is adjusted to zero by variation of the rheostat in the balancing circuit. The white Carrara glass standard is then placed over the sample opening, and the reading of the microammeter with the white standard in place is adjusted by variation of the opening of the aperture, which is placed between the elements of the condenser lens in the reflected beam. After obtaining the desired indication of the microammeter needle with the white Carrara in place, it is well to replace the black cavity over the sample opening and check the zero reading of the meter. With these adjustments made, the instrument is in condition to measure the reflectance of a sample.

In making a control measurement of brightness, the number 49 filter of the Wratten series is placed in the beam. An opaque tab of the paper is then placed over the sample opening and backed by the white Carrara. The reflectance of the sample is read directly on the microammeter. Nine stenochromatic filters are provided which cover the wavelength range from 440 to 690 mμ. The aperture of the condenser lens must be widely varied when the various filters are used. There is adequate sensitivity for all filters.

A control measurement of either printing opacity or contrast ratio may be made on the Higgins reflection meter, but no claim is made that the values agree with TAPPI opacity values. Printing opacity is measured by taking the ratio of the reflectance of a single sheet backed by the black velvet-lined cavity to the reflectance of an opaque pad. Contrast ratio is obtained by taking the ratio of the reflectance of a single sheet backed by the black cavity to that of the sheet backed either by $MgCO_3$ ($C_{.97}$) or by the white Carrara glass standard ($C_{.75}$).

Spectral Characteristics

As the instrument is an abridged spectrophotometer and the stenochromatic filters are placed in the reflected beam, the spectral characteristics of this instrument are classed as S4 of the general classification given in Instrumentation Studies XX. In previous discussions of the spectral characteristics of reflection meters, we have generally spoken separately of the spectral energy distribution of the source, spectral transmittance of the optical system, and of the spectral response of the phototube. This was done in order that the effect on measured reflectance of spectral variables could be calculated or discussed in terms of the individual changes which are likely to occur in any or all of these variables. In an instrument which is to be used as an abridged spectrophotometer, it is required only that one know the effective wavelength[3] of the instrument for each of the several filters, for the purpose of plotting reflectance versus effective wavelength and thereby obtaining an approximate spectral reflectance curve. To be sure, if such an approximate reflectance curve is not desired, it is still desirable to know in what spectral range the filter is effective.

It must be emphasized that the permanence of the spectral characteristics of the source, the filter, and of the phototube is of major importance with regard to the measurements made with filter 49 in place, i.e., for the measurement of brightness, for this filter transmits a fairly broad wavelength range. In general, the changes in the effective wavelengths of the other stenochromatic filters will be small compared with the observed changes for filter 49. In the case of this instrument it was thought preferable to measure the effective wavelengths of the several filters directly rather than to measure the individual characteristics which would be required in order to calculate effective wavelengths.

The effective wavelength of the instrument with filter 49 was measured in the following way: The transmittance of a cell containing transparent liquids whose spectral transmittance curves were straight lines was measured. It was found that a dilute coffee solution could be used. The concentration of the coffee in water solution was adjusted until the spectral transmittance (as obtained on the G. E. recording spectrophotometer) of a 5-mm. thickness of the solution was a straight line from 400 to 510 mμ varying from 10% at 400 to about 50% at 510. The transmittance of these solutions of coffee was measured in the following way: A cell filled with pure water was placed in the reflected beam immediately between the phototube and the Corning infra red-stopping filter. An aperture was placed in the beam so that all the light passed through the liquid of the cell. The deflection of the microammeter was then adjusted to 100. The cell containing water was re-

* μa = microamperes.

[3] For a definition of effective wavelength, see Instrumentation Studies XX *(1)*.

placed by one containing the coffee solution, and the microammeter reading corrected for nonlinearity was taken as the transmittance of the sample. The cells were immediately transferred to the G. E. recording spectrophotometer, and the wavelength of the light was changed until the transmittance of the coffee cell was equal to that observed on the Higgins instrument. The wavelength dial of the G. E. recording spectrophotometer was then read and this wavelength was taken as the effective wavelength of the Higgins instrument (with the 49 filter in place). The effective wavelength thus determined for the 49 filter was found to be 452 mμ with a probable error of one mμ in the determination. Trimming filters are provided with the instrument, to be used with the 49 filter, so that the effective wavelength may be changed to approximate more nearly the effective wavelength of the G. E. reflection meter using this filter. The change in the effective wavelength using the Wratten 86B filter as a trimming filter was seven mμ.

Similar measurements were carried out for the other filters provided with the instrument. The concentration of the coffee solution had to be varied for use with the different filters so as to obtain a straight-line spectral transmittance curve for the spectral range passed by the filter in question. The results are given in Table I.

The wavelength ranges transmitted by the Wratten filters 71A and 70 each in combination with the Corning Aklo are too wide to be classed as strictly stenochromatic filter combinations. Hence, for samples whose reflectance curves have appreciable curvature in the range from 610 to 700 mμ, there will be an appreciable discrepancy between the Higgins reflectance and that obtained on a spectrophotometer of the same geometry.

TABLE I.—MEASURED WAVELENGTHS FOR FILTERS

Filter	Effective Wavelength mμ
49	452
50	457
70	686
71A	650
72	610
73	575
74	530
75	484
76	441

As noted above, it is necessary that the effective wavelength of these filters be constant with time. As was pointed out in Instrumentation Studies XX, variations in any one or in all of the following factors give rise to changes in the effective wavelengths: spectral energy distribution of source, spectral transmittance of filters, and spectral response of the phototube. In this particular instrument, the spectral reflectance of the silvered reflectors used with the tungsten filament lamp must also be considered. In previous work on instruments utilizing filters similar to filter 49 it has been shown that, for ordinary samples, the variation in reflectance due to change in spectral distribution of an incandescent lamp during its normal life was of the order of 0.1 to 0.2%. Experience has shown us that we may rely with reasonable confidence on the permanence of the spectral transmittance of the Wratten series of monochromatic filters and of the spectral sensitivity of phototubes similar to that used in this instrument.

Hence, it appears that the largest chance for change in effective wavelength with time is to be associated with the change in the reflection characteristics of the silvered surfaces. Mr. Higgins was kind enough to provide several reflectors which had been used for some time and were tarnished. These reflectors were substituted for the new ones, and reflectance measurements were made on a series of typical white papers for both the new and the old reflectors. The results are given in Table II.

It was found that the reflectances observed with the tarnished reflectors in place were of the order of 0.5 to 0.9% higher than those using the new reflectors for the range of typical white papers. The transmittances of a series of Wratten filters were measured (*see* Table II) with the new and tarnished reflectors in place, and the latter values were higher by 1 to 1.5 points, which indicated an increase in effective wavelength of about seven mμ. It is seen that the major difficulty in maintaining a constant effective wavelength on the Higgins instrument is the requirement that the spectral reflectance curve of the silvered mirrors be constant. This simply requires that they be polished at reasonably frequent intervals.

A very important spectral characteristic which we have discussed in previous reports is the contribution to the photocurrent due to the response of the phototube to infrared light, whether it be present in the beam incident on the sample and reflected by it or whether it be due to fluorescence of the sample in the infrared. Consequently, the infrared transmittance of the series of stenochromatic filters was measured using the Wratten 87 filter to isolate the range of the infrared spectrum of interest. The transmittance of the no. 87 filter becomes appreciable at 760 mμ. Since the transmittance of these stenochromatic filters to the light passed by the no. 87 filter would indicate only a minimum value of the infrared error present, the transmittance of these filters to the light passed by the Wratten 29 filter was also measured. The no. 29 filter passes nearly all of the near infrared and has zero transmittance below 580 mμ. These results are tabulated in Table III.

A consideration of these data indicates that a red sample having a spectral reflectance of about 5% in the range from 400 to 520 mμ would show an error of one point in the reflectance measured on the Higgins instrument using filter 49. In the case of samples that show strong infrared fluorescence, only 1% of the fluorescent infrared intensity would be effective in producing an error in the photocurrent due to light presumably in the range of 400 to 500 mμ. The fact that the infrared error is extremely low is due both to the low transmittance of the infrared blocking filter and the low spectral response of the G-M 71-D phototube for wavelengths greater than 700 mμ. These results indicate that the infrared error of the Higgins instrument can be assumed negligible.

TABLE II.—DIFFERENCES IN REFLECTANCE AND TRANSMITTANCE OBTAINED WITH NEW AND OLD REFLECTORS

Sample	New Reflectors Reflectance %	* Badly Tarnished Reflectors Reflectance %
5	67.7	68.4
18	71.2	71.7
5106	81.3	82.2
Filters (Wratten no.)	**Transmittance %**	**Transmittance %**
1	25.1	26.7
6	35.1	36.6
12	1.3	2.0
17	16.2	17.5
30	34.7	35.0

* The tarnished reflectors were *badly* tarnished; hence the above-noted differences are much larger than are to be expected in normal careful use of the instrument.

TABLE III.—TRANSMITTANCE OF WRATTEN 87 AND 29 FILTERS TO LIGHT PASSED BY THE AKLO INFRARED BLOCKING FILTER AND THE WRATTEN "MONOCHROMATIC" FILTERS

Monochromatic Filters no.	Transmittance Wratten 87 %	Transmittance Wratten 29 %
49	0.20	1.0
50	0.20	3.0
70	0.33	..
71A	0.75	..
72	0.20	..
73	0.10	*6.0
74	0.09	0.10
75	0.00	0.10
76	0.00	0.10

* The transmittance of both the no. 73 and the no. 29 are appreciable over the same part of the range between 580 and 600 mμ; hence this value is too high.

Photometrical Features

As described above, the microammeter, which indicates the reflectance of a sample relative to that of the arbitrary standard, measures the difference in the plate current of the 36 (amplifier) tube due to light reflected from the sample. Since the measured reflectance is taken as the ratio of the two currents observed for the sample and for the standard, it is seen that the photometry of this instrument falls under the general heading of P6, or direct reading. It will be recalled that in general this means of photometry is the least preferred of the types outlined. The main condition to be met by such a photometric system is that the indicated current of the microammeter be directly proportional to the flux received by the phototube. In order to study the actual relation between the indicated change in the plate current and the change in flux on the phototube, an inverse-square law arrangement was set up. The following method was used: A piece of flashed opal glass was placed over the sample opening of the instrument. All filters were removed from the optical path between the sample opening and phototube. A 6-8-volt, 50 c.p. headlight lamp having a concentrated filament was used as the approximate point source of light. Calculations from equations presented in Walsh's Photometry (*2*) indicate that for the above arrangement the inverse-square law is accurate to better than 0.2 point reflectance. The measurement carried out is as follows: The lamp was moved sufficiently close to the flashed glass to obtain a full scale reading of 100 μa on the meter. This position was accurately noted, and readings of the microammeter were taken for distances between the lamp and flashed glass up to 50 inches. Theoretical values of the microammeter reading were then calculated, using the fact that the readings should be inversely proportional to the square of the distance between the flashed glass surface and the filament of the lamp. Figure 3 gives the curve showing the errors in the reflectance scale of the Higgins instrument as determined by the inverse-square law. The curve indicates that the actual reflectance scale of the Higgins instrument is low and in error by a maximum value of 0.7 point. The scale of the Weston microammeter was found to be accurately linear. In order to account for the variation of observed reflectance as compared to theoretical values, calculations were made using the characteristic curves of the type 36 amplifier tube which give plate current versus control grid voltage. These calculations indicated a maximum error of 0.43 point at 50% reflectance. It is seen that the theoretical error is about half of that actually observed. The facts that the 71-D phototube is a gas-filled tube having an ascending characteristic, and the actual characteristic curve for the 36 type tube may differ appreciably from the average, may account for the discrepancy of the observed and calculated error in the reflectance scale. This observation of the variation in observed reflectance as compared with theoretical values indicates that the scale of the Higgins instrument is fundamentally in error. The accuracy might be improved by the choice of another amplifier tube. It must be mentioned, however, that if one desired to obtain reflectances without photometric error, these values could be obtained from a correction chart such as that presented in Fig. 3.

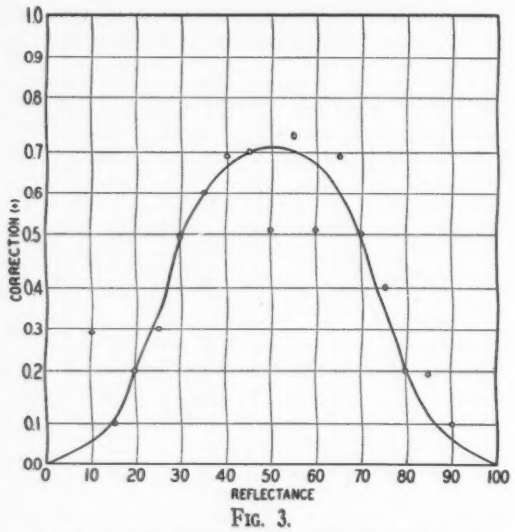


FIG. 3.

Correction to be Added to Observed Higgins Reflectance

In order that a study might be made of the variation in the accuracy of the Higgins reflectance scale with changes in screen grid voltage and plate current, the reflectances of a series of samples were obtained for different plate currents and screen grid voltages. These data are presented in Table IV. The data in Table IV indicate the typical differences in reflectance which are likely to be observed on the instrument for different plate currents and for different applied screen grid voltages. The latter values are of significance when one considers the reflectance changes which might be observed when old B-batteries are replaced by new ones. Conclusions to be drawn from these data are: First, no appreciable change in reflectance is observed when the plate current is changed from 1.6 to 2.0 ma. Second, for the same plate current of 1.75 ma., change in screen grid voltage from 60 to 67.5 volts causes no observable change in reflectance.

A very marked fatigue effect was noted. This fatigue (which was later corrected) was evidenced by the fact that the microammeter needle required a time much longer than its natural period to come to an equilibrium position. In order to obtain a measure

TABLE IV.—CHANGES IN REFLECTANCE ASSOCIATED WITH CHANGES IN PLATE CURRENT AND SCREEN GRID VOLTAGE

Plate voltage	135 v.	135 v.	135 v.	135 v.
Screen grid voltage	67 v.	67 v.	67 v.	60 v.
Plate current	1.6 ma.	1.75 ma.	2.0 ma.	1.75 ma.
Sample	Reflectance			
1	78.1	78.2	78.1	78.2
4	70.2	70.4	70.3	70.2
11	70.8	70.9	70.8	70.9
29	61.7	61.8	61.9	61.8
36	57.3	57.5	57.5	57.6
39	24.9	24.8	24.7	24.9
40	34.0	33.9	33.9	34.0
41	45.8	45.8	45.7	45.7
42	29.4	29.5	29.5	29.5
48	6.0	6.0	6.0	6.0

of this fatigue, the galvanometer deflection was noted as a function of the time after changing the reflectance of the sample opening from zero to approximately 100% or vice versa. Curves showing the deflection as a function of time are given in Fig. 4. It was found that a time of three minutes was required for the galvanometer deflection to reach a value within 0.1% of its final equilibrium value. This set of data was obtained in the first few days of operation of the instrument. In contrast to this, a curve is also given for the fatigue a month later. It is seen that there was a marked difference in the fatigue behavior of the instrument at these two different times.

In general, gas-filled phototubes do not exhibit a fatigue effect such as observed above, and hence it appeared that the resistor in the grid circuit of the 36 tube was responsible for the effect. Consequently, the resistor was replaced with a White resistor[4] of appropriate resistance. Similar data were obtained with this resistor in the circuit, and it was found that the microammeter needle reached its equilibrium value within five seconds after the sample had been changed.

It was felt desirable to check the reflectance scale with the resistor in the circuit. Consequently, the percentage transmittance of a series of screens whose transmittances varied from 22.5 to 78% was measured both for the normal resistor and for the White resistor. These transmittance values agreed to within 0.1%. In the work reported herein, proper account of fatigue was taken. These factors will be more completely discussed in the section on the operating characteristics of the instrument.

It was mentioned in the description of the instrument that there is adequate sensitivity available for making measurements with any one of the monochromatic series of Wratten filters. The scale divisions of the microammeter are sufficiently large so that the reflectance may be accurately estimated to within 0.2 point. Reproducibility of measurements was observed by making 10 consecutive measurements of the reflectance of four samples varying in reflectance from 57.5 to 78%. These data indicate that the reproducibility, or precision, of the instrument is adequate, inasmuch as the probable error in the deviation of a single observation of reflectance from the average of 10 is about 0.1 point. The probable error in the determination of the mean value of 10 readings is appreciably less than 0.1 point. This precision obtains when measurements are made on the same area of the *same* specimen.

[4] S. S. White Dental Co., New York, N. Y.

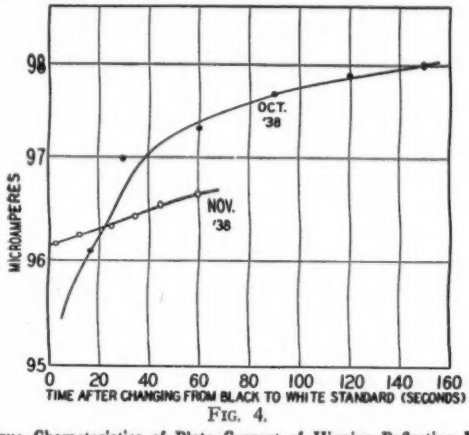


FIG. 4.

Fatigue Characteristics of Plate Current of Higgins Reflection Meter for Different Dates

Geometrical Characteristics

The geometry of the illuminating and viewing system of the Higgins reflection meter is to be roughly classified as a mixture of G1 and G4 (45 degrees unidirectional and diffuse illumination). The sample is illuminated from three directions with a mean angle of incidence of 45 degrees, while it is viewed at 90 degrees with the surface by means of an approximately unidirectional beam. The three lamps are mounted at angles 120 degrees apart on a circle. This mode of illumination is intended to eliminate the usual "grain" effects associated with the difference in reflectance of the sample measured when its machine direction is alined parallel and perpendicular to the plane of incidence of a unidirectional beam.

The reflectors and watch glass diffusers illuminate a large area; at the same time they cause only small local heating of the sample as compared to what would occur in a focused beam of the same flux. However, there are no heat filters in the incident beams, and, consequently, the sample does become heated, although this heating is not serious.

At first sight it would appear that the reflectances obtained on the Higgins instrument should simply approximate the mean value of the reflectance for two directions 90 degrees apart as determined on an instrument using unidirectional illumination at 45 degrees and normal viewing.

The solid angle subtended by each of the reflectors at the center of the sample opening is 0.5 steradian, and the solid angle subtended by the aperture of the condenser lens at the normal opening for reflectance measurements made with filter 49 is 0.02 steradian. The solid angle of 0.5 steradian subtended by each reflector is too large to permit classification of the illumination as 45 degrees unidirectional. The conclusion to be drawn from this discussion then would indicate that the reflectances measured on this instrument should be between those observed for an instrument of geometry G1 and those observed on an instrument using geometry G4.

There are several factors in the design of the optical system of the Higgins instrument which will be discussed in order that estimates may be made of the changes in reflectance which may be observed owing to changes in these factors. In the normal design of the instrument there is no defining diaphragm in the reflected beam; hence the sample opening, as well as its bakelite surroundings, are imaged on the phototube. It is the light reflected from this bakelite and possibly that scattered from within the instrument which contribute to a definite photocurrent when the black velvet box is in place. Agreement between reflectances measured for the cases in which the phototube did and did not "see" the bakelite indicated that there was no appreciable error owing to reflections from the bakelite of the light originating at the sample and reflected back to the bakelite by surrounding walls and objects of the lamp compartment.

Changes in reflectance to be observed with typical changes in the focus owing to replacement of lamps were investigated, and no changes in reflectance greater than 0.1% were found. Inspection of the instrument showed the possibility of specularly reflected light entering the aperture of the condenser lens and thereby arriving at the phototube surface. A maxi-

mum contribution from specularly reflected light was estimated by inserting the no. 70 filter, opening the aperture of the condenser lens to as large a value as is used in practice, and measuring the reflectance of a second surface silver mirror. The reflectance of this mirror was found to be 3%. This means that the illuminating rays cover a wide range of angles. While errors owing to direct specular reflectance are small, this large spread of angles will account for differences between Higgins reflectance and reflectance determined with a geometry more nearly approximating 45 degrees unidirectional illumination.

There is a projecting shielding tube painted black on the inside which shields the condenser lens from light directly scattered from the reflectors. The estimation of a possible error owing to light specularly reflected from the shielding tube was made as follows: With a cylinder of black felted paper of reflectance much lower than that of the painted surface in place in the shielding tube, a typical white paper surface was placed in the sample opening and the microammeter needle was adjusted to read 95%. The black paper was removed, and the change in microammeter current was observed. This was found to be less than 0.1 μa., which indicates that error owing to such reflection is much less than 0.1 point. For the case in which a large aperture is used to obtain sensitivity, as, for example, with the no. 76 filter, the above measurement was repeated. A change of one μa in 95 was observed. This indicates that. for ordinary samples, a maximum of 1% of the photocurrent could be attributed to the light specularly reflected from the shielding tube. Contribution to an error in the reflectance measurement from this cause would be essentially compensated in the case of measurement of samples whose angular distributions of reflected light were similar.

In order to estimate the effectiveness of this mode of illumination, in eliminating grain effects, a series of six samples which covered a wide range in surface contour was chosen, and reflectance measurements were made for two orientations of the sample 90 degrees apart. These samples included coated book, 100% rag bond, sulphite bond, supercalendered book, sulphite pulp lap, and alpha pulp lap. In no case was there a difference in reflectance greater than 0.1% noted between the values obtained for the two orientations. Hence, it may be concluded that the reflectance measurements as made on the Higgins instrument are independent of the orientation of the sample, or that there is no "grain" effect. Where one is interested only in control measurements, the absence of grain effect is convenient. However, the grain effect is present in visual observation, and therefore this mode of illuminating is not as satisfactory as unidirectional illumination where correlation with visual observation for a given sample orientation is desired.

The phototube is mounted on a socket which provides both a lateral and an axial adjustment of the distance between the phototube and condenser lens. At the normal distance between these two elements, practically all of the light gathered by the condenser lens is received by the cathode of the phototube. For distances greater than this, a part of the light is lost and does not reach the cathode surface. It then becomes important to study the variation in reflectance of the sample depending upon the distance between the phototube and the condenser lens. Table V presents the reflectances of samples taken for the normal position of the phototube and for the position of extreme variation. It is seen that the reflectance of these papers is from 0.2 to 0.4% lower for the extreme distance between the phototube and the condenser lens as compared to the normal distance. Hence, it may be assumed that axial adjustments of the phototube within the extreme limits will contribute to differences up to 0.4% reflectance. These values of reflectance were determined directly against magnesium carbonate. For the extreme position of the phototube, the reflectance of the white Carrara glass standard was 76.0 as compared with the value of 75.0 observed for the normal position of the phototube.

TABLE V.—VARIATION OF REFLECTANCE WITH DISTANCE BETWEEN PHOTOTUBE AND CONDENSER LENS

Sample	Phototube at normal distance	Phototube moved 3/8 inch farther from condenser lens
1	78.2	78.0
3	76.8	76.4
5	68.3	68.0
7	67.8	67.5

This last noted difference in reflectances of the Carrara glass standard brings up the general discussion of the irradiation effects in such translucent glass reflecting materials. In Instrumentation Studies XIII *(3)* it was shown that the reflectance of a white Carrara glass depends markedly upon the area of the glass standard illuminated. This apparent difference in reflectance is caused by the internal scattering of light in the glass standard which effectively changes the volume from which light is received by the viewing arrangement. It is found that the reflectance of a Carrara glass standard relative to magnesium carbonate decreases as the illuminated area of the sample decreases. Hence, if one uses the Carrara glass working standard without checking its value relative to magnesium oxide, changes in the reflectances of papers will be observed when different areas of sample opening are used. It is often possible to use this effect as a trimming adjustment for the purpose of making reflectance measurements obtained on different instruments equivalent in spite of other differences in geometrical characteristics.

Operating Characteristics

There are two features of the instrument which are of special advantage from a general instrumentation point of view. First, the sample holder and clamping arrangement is designed so that large areas of paper may be slipped into place without any care or attendant trouble associated with cutting of samples to a standard size. Second, the direct reading feature of the instrument is preferred by many operators.

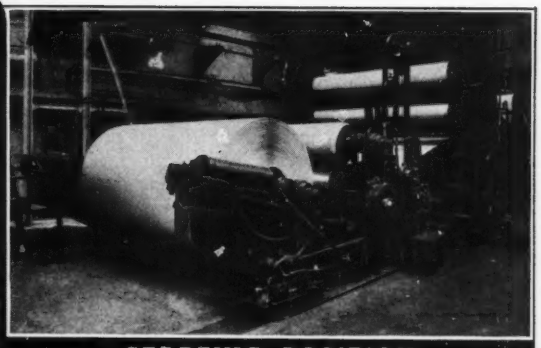
Several factors which would be responsible for erratic fluctuations of the microammeter needle are state of charge of the storage battery and steadiness of the B-batteries, faulty connections, faulty electrical grounding, and the effect of stray external light. As long as the specific gravity of the storage battery was between 1.200 and 1.250, there was no observable fluctuations in the current registered by the microammeter. B-batteries were operated continuously so that the voltage varied from 135 down to 128 volts, and no erratic fluctuations were observed which could be assigned to this decrease in voltage of the battery. However, it is generally observed that a battery, which has been operated for a time sufficiently long for the voltage to drop by this

BELOIT

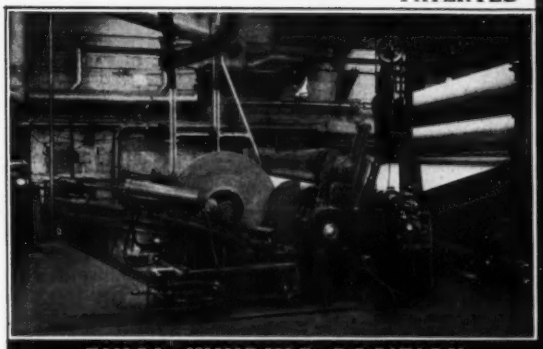
BOARD MACHINE

Reel

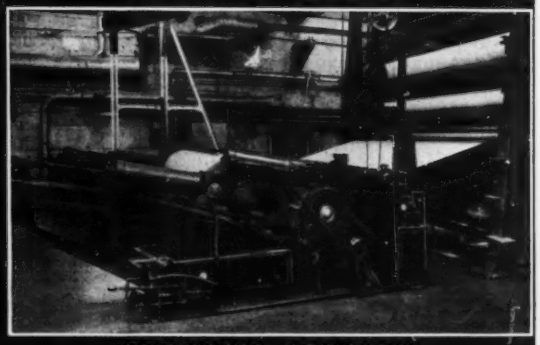
PATENTED



STARTING POSITION



FINAL WINDING POSITION



TRANSFER POSITION

DESIGNED FOR VERY HEAVY DUTY—TO WIND UP TO 78" DIAMETER ROLLS.

AIR PRESSURE, INDEPENDENTLY APPLIED TO FRONT AND BACK SIDES OF REEL SPOOL, MAINTAINS CORRECT WINDING CONDITION FOR GOOD ROLLS.

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amount, will cause fluctuations in the plate current. Some difficulty was had in obtaining a constant microammeter current during the first days of operation of the instrument, but these difficulties were finally traced to loose connections, as suggested in Mr. Higgins' instructions.

Adequate provision is made for completely grounding the instrument case, and since the construction of the instrument is of light metal and the various compartments are completely enclosed, the amplifying system is electrically shielded. However, this shielding is not complete since a fluctuation of the microammeter may be caused by ordinary sources of static placed in the vicinity of the instrument.

Care must be taken not to make simultaneous contact between the terminals leading to the microammeter and the ground connection of the instrument or the case of the instrument, because of the fact that the microammeter is at a potential of +135 volts relative to ground and a shock may be obtained. However, in normal use, the terminals of the meter are almost hidden, and a shock would not be obtained unless the operator deliberately touched the terminals and a ground connection simultaneously.

No difficulty has been experienced because of poor contacts in the various rheostats or switches.

In most reflection meters, a warm-up time is required before an accurate series of reflectance readings may be made. This warm-up time is the time required for the plate current of the amplifier to become constant. Readings of the plate current for the black velvet cavity in place in the sample opening were made as a function of time after turning the instrument on. From these data it is apparent that a warm-up time of at least 15 minutes must elapse before accurate measurements are possible. If a series of measurements throughout a long period are to be made, the switch for the source of light may be turned off, thereby cutting down the current drain of the storage battery. This switching provides the possibility of obtaining reflectance measurements at any time after the initial warm-up period, within a minute or two after turning on the lamp switch.

Care must be taken to check the zero of the instrument at intervals of about four minutes if reflectance measurements good to 0.2 point are to be made. This requirement must be met, because of the fact that the zero of the microammeter drifts with time.

Comparison of G. E. and Higgins Meters

In order to test the possibility of the use of the Higgins reflection meter for making control measurements of "brightness," the reflectances of a series of 50 samples were determined on both instruments. The measurements were carried out in the following way. The reflectance of a pad of each of the papers was measured on the Higgins instrument, using filter 49. The average of three individual measurements was taken as the Higgins reflectance value for this pad. The reflectance scale was standardized against the G. E. reflectance meter scale by measuring the reflectance of a magnesium carbonate block on the G. E. reflection meter and assigning this value to the reflectance of the block when measured on the Higgins instrument. The G. E. reflection meter measurements were made by averaging 10 individual values of reflectance for the same specimens measured in the Higgins instrument. Five of these values were taken with the machine direction parallel to the plane of incidence, and the remaining five with the machine direction perpendicular to this plane.

The complete series of measurements were made both in October, 1938, and again in February, 1939. The results of these measurements are given in Table VI. Agreement between the Higgins and G. E. reflection meter values could be expected only when comparison was made between the average of the reflectances obtained for the machine and cross machine directions on the G. E. reflection meter and the reflectance directly obtained on the Higgins instrument. Hence, only the averages of the values obtained on the G. E. reflection meter are given in Table VI.

In October, 1938, most of the Higgins values were lower than those obtained on the G. E. reflection meter, with a maximum discrepancy of 1.1%. In February, 1939, practically the same general trend in the comparison of the results of the two instruments was observed. The data indicate that on the whole the differences between the Higgins values and the G. E. reflection meter values were constant over this period of four months.

The question immediately arises as to how the comparison between the values obtained on the two instruments will be affected by making the corrections to the reflectances indicated by the photometric errors in the Higgins instrument and by the difference in the effective wavelength of four mμ for filter 49. Table VI includes the Higgins reflectances corrected for photometric errors in the reflectance scale, the Higgins values corresponding to an effective wavelength of 456 mμ, and the differences between the Higgins and the G. E. reflection meter values when both corrections are simultaneously applied. From a consideration of the data in Table VI, it is seen that 32 out of the 41 uncorrected values quoted agree with the G. E. reflection meter values to within 0.5 point. Similarly, 32 of the values agree within 0.5 point after correcting the Higgins values for the photometric errors. When only the correction corresponding to the shift in effective wavelength from 452 to 456 mμ is made, 27 of the Higgins values are within 0.5 point. When both corrections are applied to the Higgins data, only 11 values are within 0.5 point, and 29 are within one point. The conclusion to be drawn from this discussion is that the uncorrected Higgins values are on the whole in best agreement with brightness obtained on the G. E. reflection meter, and hence for control purpose it would be better to use the Higgins values directly obtained, rather than to consider the possibility of applying the particular corrections discussed above.

It is surprising that when both the corrections for photometric errors and effective wave lengths are made on the Higgins reflectances the agreement between the G. E. and Higgins instruments is poorest. It was thought that differences in the geometry of illuminating the samples must be responsible for the abovementioned discrepancy. In order to verify this idea experimentally, the reflectances of samples were redetermined after the ground glass diffusers had been removed from the reflectors (against magnesium carbonate to eliminate changes due to irradiation effect). The reflectances decreased by as much as 0.8 point. This result is consistent with the findings and indicates that better agreement would be obtained if all *three* classes of corrections could be applied. Another way of expressing this is to say that differ-

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ences of a geometrical nature tend to compensate for the spectral and photometric differences.

In considering the Higgins reflection meter as a control instrument for the measurement of brightness, it becomes important to discuss the amount of time required to perform measurements. In view of the small probable error in the determination of a single value of reflectance on the Higgins instrument, it is necessary only to make two measurements of reflectance on a given, *small* specimen (for example, an 8.5- by 10-inch sheet) as compared with 10 on the G. E. reflection meter, to obtain average values for which the probable errors in the mean values are comparable. It is not implied by this that two readings on the Higgins reflection meter are sufficient for any given sample: Several readings on several specimens should be made, since the larger area of illumination does not eliminate the effect of sample variations. When this important fact is considered, it is seen that there is not such a large difference in the number of necessary readings to be obtained on the two instruments. In general, it is expected that routine measurements may be taken with appreciably greater speed on the Higgins instrument. This presumes that there are no fluctuations or appreciable drift in the deflection of the microammeter of the Higgins reflection meter.

The work reported herein on the correlation of brightness values obtained on the Higgins reflection meter and the G. E. reflection meter was done on the supposition that both instruments would be used with the same ultimate standard of reflectance. In this work, the pot opal glass standard of the Higgins instrument was standardized against the brightness scale of the G. E. reflection meter through the use of magnesium carbonate.

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(3) The Institute of Paper Chemistry, *Paper Trade J.* 104, no. 18:47-53; no. 19:51-63; no. 20:45-49 (May 6, 13, 20, 1937).

TABLE VI.—COMPARISON OF G.E.R.M. BRIGHTNESS WITH UNCORRECTED AND CORRECTED REFLECTANCES AS MEASURED ON THE HIGGINS REFLECTION METER

Column Headings

I Higgins, uncorrected, Oct., 1938
II G.E.R.M., Oct., 1938. (These data are the averages of readings taken with the machine direction parallel with and perpendicular to the optical plane.)
III Higgins (uncorrected) minus G.E.R.M.
IV Higgins, uncorrected, Feb., 1939.
V G.E.R.M., Feb., 1939.
VI Higgins (uncorrected) minus G.E.R.M.
VII Higgins, corrected for inverse square (Feb., 1939).
VIII Higgins (corrected for inverse square law) minus G.E.R.M (Feb., 1939).
IX Higgins, corrected for effective wavelength.
X Higgins (corrected for effective wavelength) minus G.E.R.M., Feb., 1939.
XI Higgins (corrected for both inverse square and effective wavelength) minus G.E.R.M.

Sample	I	II	III	IV	V	VI	VII	VIII	IX	X	XI
1	78.1	78.49	—0.39	77.8	78.2	—0.40	78.1	—0.10	78.1	—0.10	+0.2
2	74.2	74.59	—0.39	73.6	74.2	—0.60	74.05	—0.15	74.13	—0.07	+0.38
3	76.7	76.79	—0.09	76.1	76.5	—0.40	76.5	—0.00	76.57	+0.07	+0.47
4	70.5	70.62	—0.12	69.8	69.97	—0.17	70.30	+0.33	70.27	+0.30	+0.80
5	68.3	68.46	—0.16	67.5	67.88	—0.38	68.0	+0.12	68.55	+0.67	+1.17
6	69.35	68.97	+0.38	68.6	68.05	+0.55	69.10	+1.15	69.20	+1.15	+1.75
7	67.8	67.1	+0.70	66.8	66.32	+0.48	67.35	+1.03	67.40	+1.08	+1.63
8	66.2	66.41	—0.21	65.7	65.95	—0.25	66.25	+0.30	66.3	+0.35	+0.90
9	74.3	74.35	—0.05	73.8	73.93	—0.13	74.20	+0.27	74.4	+0.47	+0.87
10	73.8	73.8	+0.00	73.4	73.48	—0.08	73.80	+0.32	74.0	+0.52	+0.92
11	70.9	70.71	+0.19	70.3	70.55	—0.25	70.80	+0.25	70.77	+0.22	+0.72
12	70.7	70.9	—0.20	70.25	70.51	—0.26	70.75	+0.24	70.65	+0.14	+0.64
13	81.3	82.09	—0.79	81.0	81.67	—0.67	81.30	—0.37	81.57	—0.10	+0.20
14	76.6	76.77	—0.17	76.2	76.41	—0.21	76.60	+0.19	76.70	+0.29	+0.69
15	76.8	76.6	+0.20	76.2	75.97	+0.23	76.60	+0.63	76.83	+0.86	+1.26
16	75.0	74.92	+0.08	74.25	73.97	+0.28	74.65	+0.68	74.88	+0.91	+1.31
17	74.55	74.31	+0.24	74.20	....	...	74.60	...	74.81	...	...
18	71.0	70.79	+0.21	70.60	70.32	+0.28	71.10	+0.78	71.37	+1.05	+1.55
19	67.8	67.92	—0.12	67.00	67.45	—0.45	67.50	+0.05	67.67	+0.22	+0.72
20	72.2	72.83	—0.63	71.70	72.31	—0.51	72.20	—0.01	72.37	+0.16	+0.66
21	66.35	66.08	+0.27	65.25	65.74	—0.29	65.80	+0.06	65.92	+0.38	+0.73
22	70.3	70.41	—0.11	69.90	70.09	—0.19	70.40	+0.31	70.50	+0.41	+0.91
23	72.0	72.08	—0.08	71.6	71.66	—0.06	72.05	+0.39	72.13	+0.47	+0.92
25	64.8	65.09	—0.29	64.25	64.89	—0.64	64.80	—0.09	65.05	+0.16	+0.71
26	69.2	69.33	—0.13	68.80	69.18	—0.38	69.30	+0.12	69.47	+0.29	+0.79
27	73.0	73.01	—0.01	72.70	72.69	+0.01	73.15	+0.46	73.27	+0.58	+1.03
28	63.6	63.39	+0.21	63.1	62.99	+0.11	63.65	+0.66	63.97	+0.98	+1.53
29	61.9	61.75	+0.15	61.6	61.4	+0.20	62.20	+0.8	62.27	+0.89	+1.47
30	73.15	73.40	—0.25	72.70	73.0	—0.30	73.15	+0.15	73.30	+0.30	+0.75
31	77.0	77.34	—0.34	76.8	76.94	—0.16	77.20	+0.24	77.27	+0.31	+0.71
32	75.4	76.16	—0.76	75.6	75.81	—0.21	76.00	+0.19	75.93	+0.12	+0.52
33	71.35	72.11	—0.76	71.1	71.72	—0.62	71.6	—0.12	71.7	—0.02	+0.48
34	53.0	54.1	—1.10	...	...	...	....	...	....	...	...
35	64.1	65.1	—1.00	63.6	64.41	—0.81	64.15	—0.26	64.33	—0.08	+0.47
36	57.5	57.56	—0.06	56.6	56.45	+0.15	57.30	+0.85	57.33	+0.88	+1.58
37	57.0	57.89	—0.89	56.1	57.23	—1.13	56.80	—0.43	56.87	—0.36	+0.34
38	57.5	58.59	—1.09	56.8	57.73	—0.93	57.50	—0.23	57.53	—0.20	+0.50
39	24.0	24.05	—0.05	23.9	23.94	—0.04	24.25	+0.31	23.92	—0.02	+0.33
40	34.25	34.02	+0.23	...	....	...	....	...	....	...	...
41	46.0	46.48	—0.48	45.1	45.74	—0.64	45.8	+0.06	46.23	+0.49	+1.19
43	86.4	86.16	+0.24	86.7	86.33	+0.37	86.9	+0.57	87.10	+0.77	+0.97
44	82.25	81.86	+0.39	82.0	82.24	—0.24	82.25	+0.01	82.40	+0.16	+0.41
45	74.0	73.14	+0.86	73.7	73.74	—0.04	74.1	+0.36	74.37	+0.63	+1.03
46	67.8	66.16	+1.64	67.0	67.14	—0.14	67.55	+0.41	67.80	+0.66	+1.21
46a	10.2	9.68	...	...	....	...	....	...	....	...	...
47	13.0	13.26	...	...	....	...	....	...	....	...	...
48	6.0	5.01	...	...	....	...	....	...	....	...	...
49	18.25	17.54	...	...	....	...	....	...	....	...	...
51	....	....	...	21.0	20.67	+0.33	....	...	....	...	...
52	....	....	...	18.1	18.44	—0.34	....	...	....	...	...
53	....	....	...	61.1	61.50	—0.40	....	...	....	...	...
54	....	....	...	33.2	33.71	—0.51	....	...	....	...	...
55	....	....	...	35.70	36.81	—1.11	....	...	....	...	...
56	....	....	...	25.5	25.85	—0.35	....	...	....	...	...
57	....	....	...	31.6	30.58	+1.0	....	...	....	...	...

Government Paper Awards

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., Dec. 31, 1940—Paper Corporation of U. S., has been awarded the contract for furnishing the Government Printing Office with 5,000 pounds of 75 per cent rag, 21 x 32 white ledger paper at 15.4 cents. The same firm will also furnish 28,000 pounds of 50 per cent rag, 22½ x 28½ white index paper at 10.94 cents. Bids for these items were received on December 13. Other paper awards recently announced include the following.

Mathers-Lamm Paper Company will furnish 80,000 pounds of No. 1 quality, hard rolled binders board at 3.45 cents. Whitaker Paper Company will furnish 3,000 pounds of salmon sulphite writing paper in 17 inch rolls at 6.75 cents. Same company will also furnish 300,000 pounds of M.F. book paper in 38 inch rolls at 4.49 cents. Bids for these items were received on December 11.

R. P. Andrews Paper Company will furnish 37,000 pounds of 39 x 50 supercalendered book paper and 115,200 pounds same 38 x 48 at 5.05 cents. Lee Paper Company will furnish 12,500 pounds of 50 per cent rag, 20 x 25 gray laid cover paper and 12,500 pounds same green at 9.97 cents. Whitaker Paper Company will furnish 5,000 pounds of 50 per cent rag, 21 x 32 pink manifold paper; 13,000 pounds same green; and 6,500 pounds same cherry at 13.21 cents. Bids for all of these items were received on December 9.

Mudge Paper Company will furnish 30,100 pounds of 75 per cent rag, 44 x 64 litho finish map paper No. 40 at 11.83 cents and the same firm will also furnish 12,645 pounds same No. 56 at 11.63 cents; bids for which items were received on December 6.

Paper Corporation of U. S. will furnish 27,960 pounds of 100 per cent rag, litho finish chart paper and 7,207 pounds same 36 x 52 at 16.75 cents. Walker, Goulard & Plehn will furnish 9,750 pounds of yellow 21 x 32 sulphite manifold paper at 7.91 cents and 5,000 pounds same pink at the same price. Bids for these items were received on December 4.

Walker, Goulard & Plehn Company will also furnish 48,000 pounds of Quaker drab 20 x 25 antique M.F. cover paper at 6.75 cents and 10,000 same dark blue at the same price. R. P. Andrews Paper Company will furnish 36,000 pounds of 24½ x 30½ white mimeograph paper at 4.37 cents. Bids for these items were received on December 2.

Printing Office has received the following bids for 16,375 pounds (125,000 sheets) of 32 x 43 India tint book paper; Mudge Paper Company, 6.02 cents; R. P. Andrews Paper Company, 6.25 cents; Barton, Duer & Koch Paper Company, 6.4 cents; Stanford Paper Company, 6.4 cents; and Whitaker Paper Company, 5.9 cents.

For 14,400 pounds (150,000 sheets) of 20 x 25 blue smooth M. F. cover paper; R. P. Andrews Paper Company, 7.03 cents; Whitaker Paper Company, 7.06 cents; Mudge Paper Company, 7.01 cents; Cauthorne Paper Company, 6.82 cents; Barton, Duer & Koch Paper Company, 7.5 cents; Stanford Paper Company, 7.09 cents; Marquette Paper Company, 6.63 cents; and Paper Corporation of U. S., 7.06 cents.

For 36,000 pounds of 21 x 32 manila cardboard and 10,000 pounds same 22½ x 28½; Paper Corporation of U. S., 4.32 cents; Bartgis Bros. & Company, 4.75 cents; George W. Millar & Company, 4.94 cents less 2 per cent; Old Dominion Paper Company, 4.669

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If you are looking for belting that assures uniform machine speeds, increased production at lower belt cost per unit produced, it's TANNATE!
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cents; Perkins-Goodwin Company, 4.68 cents; Stanford Paper Company, 4.8 cents; R. P. Andrews Paper Company, 4.36 cents; and Bulkley Dunton & Company, 4.763 cents.

For 24,000 pounds of 36 x 48, 320 lbs., No. 2 kraft wrapping paper and 20,000 pounds same 200 lbs.; R. P. Andrews Paper Company, 4.38 cents; Old Dominion Paper Company, 4.919 cents; Mudge Paper Company, 4.34 cents (all or none); and Paper Corporation of U. S., 4.74 cents.

For 5,000 pounds of 100 per cent rag, 23 x 36 white ledger paper; R. P. Andrews Paper Company, 21.47 cents; Barton, Duer & Koch Paper Company, 18.23 cents; Mudge Paper Company, 18.39 cents; and Whitaker Paper Company, 29.45 cents.

For 5,000 pounds of 24 x 36 high finish red sulphite paper; Mudge Paper Company, 7 cents; Whitaker Paper Company, 8.75 cents; Mathers-Lamm Paper Company, 8.95 cents; and Tarentum Paper Mills, 8.95 cents.

Stock Preparation at TAPPI Annual

The Stuff Preparation Committee of the Technical Association of the Pulp and Paper Industry will sponsor an all day session during the annual meeting of the Association at the Roosevelt Hotel, New York, N. Y., February 17-20, 1941. W. D. Harrison of the Riegel Paper Corporation, Riegelsville, N. J., is chairman of this committee.

Following are the papers to be presented:

1. "The Production of Pulp from the Fibrous Elements of Sugar Cane Bagasse," by S. D. Wells and J. E. Atchison, Institute of Paper Chemistry.
2. "The Pulping of Wheat Straw in the Rod Mill," by S. D. Wells and P. Anthony Forni, Institute of Paper Chemistry.
3. "Measuring and Recording Freeness Continuously," by A. B. Green, Consulting Engineer.
4. "Theory and Practice of the Dilts-Cowles Hydra-Pulper," by E. M. Roots, Dilts Machine Company.
5. "Commercial Applications of the Sutherland Refiners," by D. M. Sutherland, Jr., Consulting Engineer.
6. "Disk Refiners in the Board Industry," by W. H. Hall, Bauer Bros. Company.
7. "Process Factors in the Commercial Beating of Wood Pulps," by Howard R. Gaetz, Consulting Engineer.
8. "Prosize and Certain Aspects of Rosin Sizing," by H. J. Hotz and T. T. Collins, Central Paper Company, and H. L. Davis, Johnson & Johnson Company.
9. "Importance of Roll Pressures in Beating Stocks," by C. D. DeMers, Taylor Instrument Co.
10. "The Asplund Defibrator, by Paper and Industrial Appliances.

U. of M. Alumni to Meet

Olin W. Callighan, Chairman '1924, announces that the University of Maine Alumni in the pulp and paper industry will hold their annual Paper Week luncheon at the Hotel Roosevelt, New York City, in the small ballroom on Wednesday, February 19, between 12 noon and 2 P. M. It is hoped that as many as possible will plan to attend this year. Each Maine man is urged to bring a guest and to so designate on the return post card he will receive later on to help the chairman make the arrangements.

REPORT SUCCESSFUL YEAR

(Continued from page 7)

Wisconsin Rapids, Wis., has enjoyed a satisfactory year of business in 1940, according to George W. Mead, president. In a statement issued last week, he declared:

"Our progress has been entirely normal, as our business is in no way influenced by the defense program of the national government. . . . This year we undertook construction which will aid in improvement in the manufacturing processes. It has brought added employment in the construction trades and helped increase local prosperity.

"As to 1941, I hesitate to predict any material change. The consensus of opinion is that 1941 will be a strong business year throughout the country. I see no reason to disagree. If the country is busy I feel sure our company will also be busy. If the new year is like 1940 I feel that everyone in our community will be satisfied with industrial operations and retail sales."

Work begun last September on an addition to the finishing room of the main mill at Wisconsin Rapids is proceeding rapidly. The unit is of brick, steel and concrete construction covering an area 48 by 260 feet. It will be used for finishing room operations, storage and shipping.

Structural and mechanical improvements are also being made in the old machine room. The roof is being raised to facilitate installation of improved ventilation equipment. Mechanical changes are being carried on No. 2 paper machine to increase its productive capacity.

The Consolidated company has made a gift of $50,000 towards a fund of $120,000 for modernizing Riverview Hospital at Wisconsin Rapids. President Mead is president also of the Riverview Hospital Association, and has personally guaranteed an additional $30,000. The remainder will be obtained in a community drive. Ahdawagam Paper Products Company has contributed $2,500.

Ahdawagam Expects Better Year Ahead

Although there was a decline in sales in 1940 as compared to 1939, the Ahdawagam Paper Products Company, Wisconsin Rapids, Wis., looks forward to a bigger year in 1941.

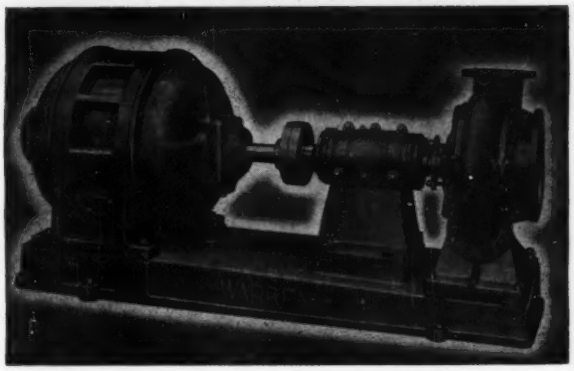
"Our tonnage for 1940 is running less than 1939 which is a result of the decline in business the first part of the year," declares Frank R. Walsh, manager. "Many buyers ordered out more stock than actually required after the war started in the fall of 1939 and the reaction from this buying caused a decline in our sales during the first six months. Although our tonnage is less for the year, the total of wages paid is the largest in our history on account of the two wage increases made since the first of the year.

"Orders have been coming in pretty well since July and we expect 1941 to run somewhat better than this year although the war has a bearing on the situation. Should the war end soon—and this is a possibility—there will be a reaction in business activity which will curtail production in several important industries and create business uncertainty for a while. However, it is probable that peace will not change permanently the trend of business activity."

NOT ONE

Suction Opening

BUT FIVE



There are no "stock answers" to stock handling problems at Warren. Literally scores of variations on basic designs are available to meet specific requirements of individual jobs. Suction openings, for example. Each size and type of Warren stock pump has at least three sizes of suction nozzle, and some have as many as five, to insure the stock reaching the impeller. . . . Impeller design, also, is varied to suit different conditions—varied in type, number of vanes, materials, in many subtle but important ways. . . . With these designs, and well-grounded experience to apply them correctly, Warren engineers *build the pump to fit the job,* insure Warren users of long, efficient service, keep pumping costs down, year after year. . . . On your requirements, it's good business to check Warren.

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WARREN PUMPS

PAPER TRADE JOURNAL
This Reg. U. S. Pat. Off.
Henry J. Berger
EDITOR

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COMING EVENTS IN PAPER INDUSTRY

AMERICAN PAPER AND PULP ASSOCIATION, Sixty-fourth Annual Convention and meeting, Waldorf-Astoria Hotel, New York, February 17-21.

TECHNICAL ASSOCIATION OF THE PULP AND PAPER INDUSTRY, Convention, Roosevelt Hotel, New York, February 17-20.

SALESMEN'S ASSOCIATION OF THE PAPER INDUSTRY, Annual Meeting and Luncheon, Waldorf-Astoria Hotel, New York, Tuesday, February 18.

NATIONAL PAPER TRADE ASSOCIATION OF THE UNITED STATES, Convention, Waldorf-Astoria Hotel, New York, February 17-20.

THE NEW YORK ASSOCIATION OF DEALERS IN PAPER MILLS' SUPPLIES, Annual Banquet, Commodore Hotel, New York, Tuesday, February 18.

NEW ENGLAND SECTION. Technical Association of the Pulp and Paper Industry—Third Friday of each month at the Roger Smith Hotel, Holyoke, Mass.

DELAWARE VALLEY SECTION. Technical Association of the Pulp and Paper Industry—First Friday of each month at the Engineers Club, Philadelphia, Pa.

LAKE STATES SECTION. Technical Association of the Pulp and Paper Industry—Second Tuesday of each month at the Conway Hotel, Appleton, Wis.

KALAMAZOO VALLEY SECTION. Technical Association of the Pulp and Paper Industry—First Thursday of each month at the Park, American Hotel, Kalamazoo, Mich.

BETTER LABOR RELATIONS

Now that the urgency of the national defense program is widely understood, it would seem imperative that all obstacles to the speedy fulfillment of that program must be removed. Full accord, cooperation and the coordination of all essential productive capacity, labor, management and government departments are all essential. As the President said in his radio address to the nation last Sunday night, the country expects that labor will settle its differences with management in an orderly manner, without resorting to strikes that will imperil the defense program.

But, the protests of the American Federation of Labor, the Congress of Industrial Organizations and the railroad unions against the award by the War Department for 1,500 light reconnaissance cars to the Ford Motor Company, is an example of the lack of cooperation of which the President spoke. The reason for the unions protests was due, of course, to the fact that the Ford labor policies were sometime ago declared to be in conflict with the National Labor Relations Act, often referred to as the Wagner Act. The National Labor Relations Board which administers this act has been the cause of months of controversy and endless friction between unionized labor and management. To a certain extent the decisions of the Labor Board have been unsatisfactory because the act itself is not clear and many of its provisions are not as equitable as it should be possible to make them. It is for this reason that some revision of the National Labor Relations Act is now recommended.

In the final report of the House committee investigating the NLRB and the National Labor Relations Act, it is asserted that the board's actions had jeopardized "the entire program of national defense" and the committee called on Congress to study the entire field of labor relations and recommended that the Senate follow the House in adopting seventeen amendments. In its text of "conclusions", the special House committee declared in reference to the National Labor Relations Board that, "Herein, the committee, on the basis of evidence and testimony before it, reached the conclusion that the board has been unfair and biased in its conduct, its decisions and its interpretation of the law. Likewise it has been grossly partisan in its attitude towards certain labor unions and most deplorably biased in its relations to employers and employees. The committee has found overwhelming proof that radical tendencies and entire absence of judicial temperament of board members and personnel are fundamentally responsible for the grave and substantiated accusations of prejudice and favoritism leveled at the board. As between the two great competing labor organizations, pronounced pro-C.I.O. sympathies have been ever-present in the board's policies and decisions."

Prior to the citation of the major objectional practices of the Labor Relations Board, the committee report explained that, "A comprehensive survey of the many instances in which the board had gone beyond the scope of the Congressional intent has been developed by the committee and an ample number of instances have been cited and discussed to support the conclusion that the board has exceeded its authority by arbitrarily substituting its autocratic judgment for the Congressional mandate. Certain regulations and instrutcions promulgated by the board, and many of its decisions, have been without color of legal authority. Attention has been directed in particular to cases involving the appropriate bargaining unit, 'run-off' elections, 'reinstatement' of employees and similar instances, where policies have been adopted and remedies invented to distort the plain language of the statute."

In summarizing these objectionable practices of the board, the committee cited six major points, as follows: (1) Blacklisting litigants before it. (2) Promoting boycotts against parties whose cases it intends to adjudicate. (3) Denial to legitimate organizations of opportunities to appear and be defended in the very litigation that may destroy them. (4) Refusing to employees the privilege of testifying in their own cases. (5) Requiring industry to reinstate persons who were never employed and pay back wages to persons never on the payrolls and to others who never even applied for employment. (6) Seeking to legalize as part of the American way of life the

infamous, anarchistic sit-down strikes and persevering in this course even when rebuked by the Supreme Court of the United States."

In summing up the achievements of the committee the following are included: (1) The formulation and speedy adoption by the House of Representatives of seventeen amendments designed to improve the act by making its provisions more equitable. (2) Abolition of the Division of Economic Research (technical service). (3) Resignation or separation from government service of certain radically minded or biased officials. (4) The development of a factual record calling for the dismissal of other employees. (5) A saving of $346,600 to the taxpayers by Congressional reduction of the board's appropriation. (6) The return, by careful management and economy, of a substantial part of its appropriation by the committee. The committee is convinced, however, that the Congress can render a further and necessary service to the people of the United States by a study of the entire field of labor relations."

In conclusion the committee report said in part: "The committee respectfully concludes that when an administrative agency of the government so far forgets its proper function as to defy the will of Congress, harbor and protect avowed enemies of constitutional government, invent and devise extra, legal (and even unlawful) methods of tormenting and ruining employers, foment and perpetuate industrial strife and oppress and penalize certain labor groups to favor others, then the time has come when the people of this country must raise their voices in insistent protest lest industrial peace, and with it the entire program of national defense, be jeopardized and the fundamental concepts upon which their government is based be ultimately and utterly destroyed."

Capital Paper Co. Meets

[FROM OUR REGULAR CORRESPONDENT]

INDIANAPOLIS, Ind., December 30, 1940—The Capital Paper Company here, held its annual sales convention last week. Managers and their salesmen from branch houses in Ohio and Illinois attended. The three-day meeting was devoted to sales talks, introduction of new lines of paper, the 1941 sales promotion program and the sales campaign for Sealskin tissues, a leader of the company. C. V. Jewell, vice-president and general sales manager, presided at the sessions. Prizes for outstanding sales records were awarded and a banquet held the night of December 28.

Paper Concerns Exchange Greetings

[FROM OUR REGULAR CORRESPONDENT]

BOSTON, Mass., December 30, 1940—Two local paper houses exchanged holiday greetings in a highly graphic way. About December 14, Storrs & Bement Company, at 289 Congress street, according to their usual custom, placed large letters in their windows, reading "Merry Christmas." A few days later, the D. F. Munroe Company, across the street at 288, responded with "Thanks, same to you."

Production Ratio Report

These statistics are based upon paper production reports to the American Paper and Pulp Association.

COMPARATIVE MONTHLY SUMMARIES[1]

Months	1940	1939	1938	1937	1936	1935	1934
January	90.2%	77.5%	63.9%	90.3%	76.1%	65.8%	.....
February	86.2%	81.7%	68.7%	90.1%	77.9%	70.0%	.....
March	83.9%	84.0%	69.6%	90.3%	76.0%	70.5%	.....
April	86.3%	82.9%	68.3%	92.1%	82.3%	70.0%	.....
May	91.8%	80.2%	69.0%	90.6%	81.6%	69.4%	.....
June	93.8%	79.7%	66.0%	87.3%	80.7%	72.3%	.....
July	87.1%	75.2%	72.0%	81.8%	77.3%	64.9%	.....
August	87.2%	82.9%	77.2%	82.9%	81.5%	70.9%	.....
September	83.2%	88.7%	76.3%	78.6%	80.5%	71.9%	58.2%
October	88.0%	96.6%	82.5%	73.5%	87.6%	75.6%	64.7%
November	86.9%	97.2%	79.6%	61.9%	88.0%	75.3%	61.7%
December	.....	91.1%	74.4%	54.5%	85.9%	71.2%	59.6%
Year Average	.....	84.9%	72.3%	80.6%	81.3%	70.5%	.....
First 51 weeks	87.9%	85.1%	72.5%	81.3%	81.3%	70.8%	.....

COMPARATIVE WEEKLY SUMMARIES[1]

CURRENT WEEKS, 1940		CORRESPONDING WEEKS, 1939	
November 16	87.4%	November 18	98.4%
November 23	86.7%	November 25	96.2%
November 30	85.9%	December 2	95.1%
December 7	86.9%	December 9	96.6%
December 14	90.6%	December 16	97.7%
*December 21	90.9%	December 23	93.9%

The following statistics show the number of mills reporting by ratio groups:

Ratio Limits	Number of Mills Reporting—Current Weeks: Nov. 16, 1940	Nov. 23, 1940	Nov. 30, 1940	Dec. 7, 1940	Dec. 14, 1940	Dec. 21, 1940
0% to 50%	57	50	64	45	48	34
51% to 100%	240	248	232	248	234	158
Total Mills Reporting	297	298	296	293	282	192

PAPERBOARD OPERATING RATIOS

Per cents of operation based on "Inch-Hours" reported to the National Paperboard Association.

Year	Jan.	Feb.	Mar.	Apr.	May	June	July
1936	62%	67%	67%	70%	69%	70%	69%
1937	80%	86%	86%	88%	85%	77%	66%
1938	54%	60%	61%	57%	58%	56%	57%
1939	60%	67%	71%	69%	64%	67%	63%
1940	71%	70%	69%	70%	76%	79%	72%

Year	Aug.	Sept.	Oct.	Nov.	Dec.	Year Avg.
1936	75%	78%	82%	80%	74%	72%
1937	74%	69%	65%	55%	45%	73%
1938	66%	66%	70%	65%	59%	61%
1939	72%	74%	84%	81%	71%	70%
1940	74%	72%	79%	77%	....	....

Week end. Nov. 16, 1940—77%
Week end. Nov. 23, 1940—77%
Week end. Nov. 30, 1940—76%
Week end. Dec. 7, 1940—78%
Week end. Dec. 14, 1940—79%
Week end. Dec. 21, 1940—80%

[1] Production-capacity ratios are based upon six-day capacity ratings which are adjusted periodically to correspond with the ratings reported by individual companies. Ratios are subject to revision until all reports are received.

* Preliminary figure.

E. H. Hall Gets Morey Supply Business

SALEM, Mass., December 30, 1940—The will of Walter Morey, Ipswich, which was recorded in Essex registry of probate December 26, gave the Morey Paper Mill Supply Company, which he owned, to a friend, Edward H. Hall of Fitchburg.

Mr. Morey died December 14. The bequest included good will, merchandise and furnishings, together with an $8,000 loan, if needed to carry on the business, the money to be repaid at the rate of $2,000 a year without interest. A daughter, Mrs. Katharine Pinkham, Poland, Me., was bequeathed $2,000. Bequests totaling $3,750 were directed to employees.

After giving his home on Turkey Shore road, Ipswich, and personal effects to his widow, Mrs. Grace Vera Morey, that town, Mr. Morey ordered the residue turned over to the National Shawmut Bank, Boston, to carry on a trust created by him November 9, 1938. The value of the estate was estimated at $100,000.

They Started Something!

PASTEUR'S contributions to the cure and prevention of disease are familiar to everyone. He has given his name to inoculation treatments for the prevention of hydrophobia; to a process for destroying harmful bacteria in milk. But the work of Pasteur had even more far-reaching effects, for his experiments helped to lay the foundations of the entire science of bacteriology. His investigations of micro-organisms and the part they play in fermentation contributed to technical progress in many industries. New weapons against disease-causing bacteria, wider knowledge of the beneficial types that are essential to the successful functioning of many industrial processes—both resulted from the work of Pasteur.

So, too, when EBG engineers first made Liquid Chlorine commercially available in America, their achievement was destined to have profound effects both in the preservation of health and in industrial progress. Communities throughout the nation quickly recognized the value of EBG Liquid Chlorine as an effective means for safeguarding the purity of drinking water supplies — and today EBG Liquid Chlorine is still further extending its usefulness in the protection of health through its application in the field of sewage sterilization.

The first cylinder of Liquid Chlorine made by EBG in 1909.

Industry also profited by the introduction of EBG Liquid Chlorine—the manufacturers of paper and textiles found it an effective and economical bleaching agent. EBG engineers, pioneers in the production of Liquid Chlorine, have *extra* years of experience in its manufacture and servicing, experience that works for *you* when you specify EBG Liquid Chlorine.

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Plant: Niagara Falls, N.Y.

EBG Liquid Chlorine

FIRST IN THE COUNTRY

PAPER TRADE JOURNAL

Section of the
Technical Association of the Pulp and Paper Industry

Edited by Ronald G. Macdonald, Secretary

Cost Accounting Methods in Paper Mills*

By J. R. Atwater[1]

Abstract

The methods and procedures of cost accounting are discussed to give engineers, chemists, and other technicians a working knowledge of factors involved.

Many technical men freely admit that they have little cost knowledge, and yet from experience I have had in dealing with the subject, there have been few complexities which could begin to compare with technical articles published on subjects pertaining to pulp and paper manufacture. I believe that the answer lies in the fact that most men filling a position, where they do not normally contact the cost accounting structure, have a list of their own problems of considerable magnitude and never get nor take time to delve into it.

Cost accounting has been defined as "a procedure for determining the actual costs of articles produced or services rendered." This came out of a book, and I think that to it should be added "and submitting to the management dynamic information which can be used for control and cost reduction." It is not one of the exact sciences. The exact cost of a manufactured product is seldom attained. It is one of the duties of the cost accountant to see that the established routine is intelligently executed so that the results will be reasonably accurate.

Before discussing cost mechanics, there are a few observations to be made concerning personnel and the system:

(1) From Montgomery's Financial Handbook—"The selection of a capable acting head for the cost department is of greater importance than the selection of a system. The most carefully designed procedure will fail if not operated with intelligence and vision. Too often the person responsible for the accounts is of the mechanical type or one who lacks an understanding of practical operating features and fails to appreciate the purposes for which costs are ascertained and used. The collection and presentation of cost figures is so important to the intelligent conduct of a business that every effort should be made to secure the best ability available for the management of the cost department."

(2) System—Fit the system to the mill. A too meager system might just as well be eliminated in favor of check-book accounting. On the other hand excess information is costly and obviously worthless if not used. All cost records, reports and methods should be carefully surveyed and questioned periodically in an effort to better existing information or to replace it with more worthwhile material. Of equal consideration are the personalities of the men to whom cost information is presented. Despite the degree to which any single plant operator may be "cost-minded" he should be currently interviewed by the cost accountant to review costs and to see whether his reports may be advantageously shortened or detail added. Operating men should be burdened with no more data than they find it possible to absorb and put to use.

(3) Mill Data—The system is again no better than the information available from the mill. A well-functioning cost department will probably find it necessary to periodically check mill reports on the accuracy of production, waste, operating and lost-time hours, and other facts. Many ineffectual hours may be spent attempting to work too meager data into what will obviously be poorly constructed results.

(4) The cost department should be used as a source of well-planned, and constructive information and not as a publishing house. Here, as for the paper machines, quality comes before quantity.

Mill Cost Accounting

A simple cost system can start with a small theoretical unit, more prevalent in past years than today. Assume a single machine manufacturing a single product; supported by steam and electric generating plants. All raw materials were purchased and the product sold in rolls. The mill manufactured 50 tons per day.

Their cost accounting department was the bookkeeper who spent a few hours at the end of the month adding all charges into a single total operating cost statement. He also prepared a statement showing cost of steam per 1000 pounds generated and electric cost per kilowatt hour. As there was no variance due to grade changes, and no distributions to make other than directly to the single machine, the grade cost was synonymous with the Total Cost Statement, made as shown in Table I.

TABLE I.—TOTAL PRODUCTION COST

Materials	Amount		Cost Per Ton
Pulps and chemicals	$31,000.00		$31.000
Coal	4,000.00		4.000
Total materials	35,000.00		35.000
Conversion			
Labor	12,000.00	(from payroll)	12.000
Supervision	1,000.00		1.000
Repair labor	400.00		.400
Repair materials	500.00		.500
Lubricants	50.00		.050
Belting	100.00		.100
Supplies, storeroom	400.00		.400
Wires	525.00		.525
Felts, jackets	650.00		.650
Expense	250.00		.250
Finishing supplies	80.00		.080
Lumber	215.00		.215
Total cost	$1,170.00		$1.170
* General indirect	1,200.00		1.200
Depreciation	4,400.00		4.400
Insurance, taxes	330.00		.330
Total	5,930.00		5.930
Grand total	$57,100.00		$57.100

Production—1,000 tons.
* Office expense.

For the same reason, no standard costs or budgets were maintained, but rather the current costs were added to previous months' costs for the year and cumulative totals for both amount and cost per ton were carried.

In order to present this cost statement the accountant obtained the following information:

* Presented at the meeting of the Delaware Valley Section of the Technical Association of the Pulp and Paper Industry, Engineers Club, Philadelphia, Pa., Feb. 2, 1940.

[1] Member TAPPI, Head of Cost and Accounting Department, Dill & Collins, Inc., Philadelphia, Pa.

1. Raw materials purchased, from his materials ledger, adjusted for beginning and ending inventories, supplied by,
   (a) Yard foreman—pulps
   (b) Beater foreman—chemicals
   (c) Power engineer—coal
   (d) Shipper—finishing materials and lumber
   (e) Storekeeper—stores

   Materials ledger accounts was based on average price, rather than 1st in, 1st out—(table explains 1st in, 1st out—infrequently used):

Sulphite pulp	Tons			
On hand 7/31	300	at	$55.00	$16,500.00
Purchased 8/3	40	at	52.00 del.	2,080.00
Purchased 8/15	200	at	50.00 del.	10,000.00
Available	540	at	52.926	$28,580.00
Consumed 7/31-8/31	285	at	52.926	15,083.91
On hand 8/31	255	at	52.926	$13,496.09

2. Payroll—amounts entered into the bookkeeping records were supplied by paymaster and segregated as to direct and repair labor.
3. Paper machine production—obtained from tally sheets and approved by superintendent.
4. Production of steam and electric from the plant engineer.
5. Finished paper inventory from the superintendent.

The bookkeeper might have split the Total Production Cost into a number of semidepartmental costs, all of which would have added to the total mill cost, but due to the simplicity of the operations, the plant manager considered it unnecessary as he felt that he was completely familiar with the operation in detail.

His final report is a Profit and Loss Statement (Table II), based on sales of 900 tons of the current production.

TABLE II.—PROFIT AND LOSS STATEMENT

Gross sales—900 tons at $70.00 per ton	$63,000
Less: Freight—900 tons at $4.00 per ton	3,600
Commission	1,600
Discount	1,000
R. & A. at $1.00 per ton	900
Total deductions	7,100
Net sales	$55,900
* Cost of sales—900 tons at $57.10	51,390
Gross profit	$4,510
Less administrative	1,000
Net profit	$3,510

* Cost of sales includes all charges of mill operation except administration and selling expense, advertising and interest on moneys borrowed, etc.

Back in the late 1800's and early 1900's, this basic type producing unit was prevalent, and little attention was paid to detailed breakdown of production costs; and by and large, neither was it necessary. However, with construction of larger mills, containing greater numbers of machines of varying deckles combined with pulp mills, coating mills, bleaching units, converting departments, etc., topped off by more and more complex grade structures, the necessity grew for determining more accurately: (1) which grades had potential earning capacity and which were uneconomic, (2) department costs instead of plant costs, and (3) a cost department to keep in step with mill growth and development instigated by Engineering and Technical Departments. The cost system should be engineered to fit the requirements of the plant, and inasmuch as no two plants are identical, no two systems are exactly alike. Even if two plants which we might pick out are similar, cost precedure might be entirely dissimilar due to: (1) the cost accountants' concept of what comprises the better control methods, and (2) differences in management viewpoint on cost requirements, etc.

The distinction between one type of cost system and another may be slight, the names indicating only those features emphasized in that particular method.

The type classifications with which we are more interested as they pertain to pulp and paper manufacture are:

(1) Actual cost system—including departmental and grade costs
(2) Standard cost system
(3) Fixed or variable budget control systems.

Actual costs are used in each of these, but in the 2nd and 3rd, a base of performance is established from which variances may be noted.

Actual Departmental and Grade Cost System

Actual costs are the basis for any system. Standard and budgetary systems merely carry the idea further. Therefore, actual cost is the subject with which we are primarily concerned. Again assume a hypothetical mill of more complex design than our first illustration, manufacturing divergent grades.

Raw Materials

Purchased raw materials into the plant are charged into the materials ledger as described for the small mill. The cost of handling the product is usually absorbed within the current cost period as an expense rather than adding the handling to the material value.

The same method, in principle, is used for raw materials or essential products locally manufactured, such as pulps, rosin size, bleach solution, and others. Where an inventory exists at the period close, it is priced at its actual cost, and consumption charged to plant at the average cost of beginning inventory plus current cost.

An adequate system must be employed for reporting quantities of pulps, beater chemicals, etc., used in each order. This may be accomplished by (1) an order card system, whereon furnish for each order is reported by the beater man on a separate order card, or (2) a daily record whereon furnish is reported by order number to be later recapitulated by a clerk. In many instances, similar furnishes may be grouped under various classification of grades, in order to eliminate useless detail. At the end of the cost period, the total quantity of each material reported will be reconciled with the amount consumed as per purchase and inventory records. This may be an arduous task in those mills where slush or ribbon pulps are a substantial component of the furnish (see Table III).

TABLE III

Grade	A	B	C	D	E	F	Total Beater Furnish	Total Materials Ledger
Bl. sulphite slush	—	—	—	—	—	—	1850	2000
Bl. sulphite purchased	—	—	—	—	—	—	310	300
Unbl. sulphite	—	—	—	—	—	—	475	500
Soda slush	—	—	—	—	—	—	1100	1000
						Total	3735	3800
								reconciliation

Beater furnish must be reconciled to materials from ledger account.

In some mills where quantities of small orders make such a system impractical, standard furnishes may be established on past performance, and grade costs constructed from these without attempting to tie the two together after each closing. In a standard cost system, the two are tied together. We will mention more detail later. With a well controlled system of consistency regulation in slush lines, and accurate weighing in of dry materials, it is not unreasonable to expect a variation of plus 5% in the former and plus 2% in the latter.

Conversion

The necessity for accurate records of production, operating and lost time cannot be overstressed, regardless of the system in use, because in many instances a double check on the data is not or cannot be made. Thus, wherever it proves practical, instrument recordings should be available for machine operations. It not only furnishes accurate data to the cost department but offers a method of control to the department head (see Table I).

Labor: The timekeeping office makes a complete distribution of all labor by departments each week, which is charged accordingly. A double check on the time-clock system is usually made through department day sheets. This may or may not include unemployment insurance or social security, depending upon individual company policies. There will be jobs throughout each mill which are of a generalized nature, such as elevator operators, janitors, interdepartment material handlers, etc. Wherever possible, it is advocated that the corresponding labor costs be distributed directly to the departments receiving the service rather than to a general mill account. By so doing, the charges will not be hidden in the general indirect expense, to which the general mill account is to be distributed.

Supervision: Debits for salaried employees are handled in the same manner as labor, except that the distribution may come from the treasurer. In the larger mills it is probable that salary distributions will be necessary. The general superintendent may be charged to a general mill account; whereas the superintendent in charge of materials preparation may be split to two or three different departments; the power engineer may be charged 60 per cent to steam—40 per cent to electric; etc.

Repair labor and materials: Repair labor and materials should, of course, be charged directly to the department receiving the benefits of the maintenance work. In those mills where a common unit exists for engaging in repair work in all departments, distribution of the time direct from the maintenance office, by a dispatcher or clerk is desirable. Job tickets are made out by the supervisor in charge of the department in which the work is to be done and sent to the maintenance department. The dispatcher together with the maintenance foreman should plan the work in advance, and when complete the dispatcher shall record on each slip the hours extended to the total labor cost for the job. It is further advisable to have a record of materials cost on each order, so that the duplicate returned to the operating department will show the total cost. There may be any number of variations in this system—the main objective is to obtain accurate distribution of labor and materials and to maintain records of completed job costs and dates. A periodical survey of the maintenance records will then show whether any given machine is requiring abnormal repairs, and if so, a study can be made on the advisability of replacement.

Other direct expense items: Other direct expense items—i.e., storeroom supplies, lubricants, belting, felts, wires and general replacements — may all be handled in much the same manner. All materials ordered either from plant stores or from the outside have a departmental designation to assign the cost to its proper place. Here again, there may be many items of a general plant nature which will have to be charged to a general mill account.

Distributed Expenses

Under this heading are included power, light and heat, office, general mill, service centers, inspection, depreciation, insurance, and taxes. There are numerous methods and bases of distributing costs to individual departments and this phase of cost accounting is perhaps the least understood and the most confusing to all, including the accountant.

There are two major reasons for distributing power and indirect expenses to individual departments: (1) to determine as accurately as possible the conversion cost of that department, which it has been assumed should bear its share of these items, and (2) to make the department head *partially* responsible for the use of power and other mill services.

There exist two schools of thought on these two points, however. Rebuttal is that (1) it is far simpler to eliminate fixed charges, distributed and other indirect from all but the major departments; (2) the cost of the final product is not affected to any great degree; and (3) the supervisor certainly cannot be held responsible for depreciation, insurance or taxes, office expense, and similar charges. If steam and electric power are not metered to each department it is impractical to attempt to direct responsibility for excess usage. The argument is further augmented by the following example: assume a book mill manufacturing the run-of-mine uncoated papers. The mill exists because of the paper machines—they are the heart of the operation. Also included are rewinders, supercalenders, and cutters. A small percentage of paper is supered, roll to sheet ratio may be 20-80. Regardless of these ratios, the company is in business to make a profit and deliver the kinds of paper required by the trade, and, therefore, the distributed whereof we speak might just as well be charged to the paper machines as to scatter it all over the mill.

However, if pulp mills, coating, or other units are a part of the picture, then some distribution must be made on an equitable basis as they are actually units set apart in their own right. The kind and degree of distribution made would have to depend upon the conditions existing at the individual mill.

Steam: Steam should be metered as far as economy will allow, to each department. Monthly distributions on an estimated base are practically worthless from both the cost and control viewpoint. Where meters are not available, it is best to distribute steam to the mill within the plant, and not departmentally; where meters are available distributions should be made as detailed as information will permit.

Electric Power: May be handled same as steam. Here, however, it is possible to obtain more accurate results from an estimated distribution, as the engineer can use the average power requirements of motors and lights as a basis.

Other Distributed Expense or Plant Overhead: The distribution of these remaining factors of overhead again becomes less involved if carried through on a plant rather than a departmental basis. The basis for such a distribution might be:

(1) Office Expense: A survey of the office force and allocation of hours of work therein to the principal operating centers will give a constant proportion to be used.
(2) Maintenance Overhead: On basis of departmental repair labor (or adjusted to plant).
(3) Inspection: Same as office.
(4) Receiving: Basis of hours or tons received by departments (or adjusted to plant).
(5) Employment and Timekeeping: Distributed on ratio of departmental payrolls.
(6) Depreciation, Insurance, Taxes: (grouped) On basis of plant account valuation.

Interdistributions of steam, electric and water: Steam cost may include electric and water; electric cost, steam and water; water cost, electric. When these distributions are completed, it is to be understood that the total cost of all three combined does not represent the total expense of all three departments. For example, steam generation may cost $10,000 per month, and if 80 per cent goes to electric, $8,000 of this amount will be included in the electric cost. Thus a true result on the cost of each is determined. Distributions to the operating departments may be made first, so that possible duplication is eliminated.

Up to this point all departmental direct costs have been allocated, indirect expense has been distributed to the operating centers, and total operating department costs are available.

TABLE IV.—PLANT DISTRIBUTION

	Operating Departments				Indirect Expense		
	A	B	C	D	S	E	O
Labor	x	x	x	x	x	x	x
Supervision	x	x	x	x	x	x	x
Other direct	x	x	x	x	x	x	x
Coal	..	..	..	..	x	..	..
Total direct	x	x	x	x	X	Y	Z
Steam	X	X	X	X	←		
Electric	Y	Y	Y	Y	←		
Other	Z	Z	Z	Z	←		
Total indirect	T	T	T	T			
Total cost	C	C	C	C	= Total direct of all depts.		

The total actual cost by itself is inadequate due to (1) effect of idle or overabsorbed time, and (2) variations in production. They can be adjusted for the former, but the latter will only show up as a true picture through grade costs.

Production and hours of operation (machine- and man-hours) are available by departments and recorded on the cost sheet. We obtain cost per 100 pounds as one control factor. Machine-hour or man-hour rates are determined, and used for the construction of grade costs.

Grade Costs

Average departmental production per time-unit obtained from total production and total time may be misleading. Averages may be well used for indications of high cost, but variations among grades demands further information be supplied to management through construction of grade costs. In the specialty mill, where there are many grades to be considered, it may not be possible to run actual costs each month on all of them, and in point of fact may be desirable not to do so. The preparation and study of a few grades in detail is more desirable than on volume which is only cursorily examined.

Materials, including pulps, filler, size alum, and other beater chemicals, are available from the recapitulation or material order cards previously mentioned. It is now up to the cost accountant to enlist the aid of the technical department in determining the yields to be anticipated from varying proportions of beater furnish. The accountant has adjusted his pulps to an airdry basis in his materials ledger but factors of paper moisture, fiber and filler retentions and combinations thereof should be considered. After a schedule of grades has been formed which dovetails as closely as possible with total yield based on past experience, the cost department can proceed. This schedule should be surveyed each cost period to check its accuracy, preferably on a moving average basis, due to possible seasonal fluctuation in retentions, and normal monthly variations (see Table V).

TABLE V.—BUILDUP OF SIMPLE GRADE COST

Materials	Furnish %	Quantity ave.	Price	Cost/100 lb. net/machine prod.
A	20.5	23.0	$3.00	$ .690
B	42.0	47.0	2.50	1.175
C	17.0	19.0	3.10	.589
Fin. broke	10.7	12.0	1.50	.180
Fiber	...	101.0	2.608	2.634
Filler	9.8	11.0	.90	.099
Total furnish	100.0	112.0	2.440	2.733
Alum	2.7	3.0	1.25	.038
Size	1.7	1.9	3.50	.067
Colors	...	...	...	.045
Total furnish	...	116.9	....	$2.883
Broke credit	...	12.0	1.50	.180
Net fiber and filler	...	...	...	2.703

Conversion	Prdo./hr.	Hours	Rate	
On 10,000 lb.	1504	6.65	$22.716[1]	1.511
Cost-end per machine				$4.214

Cost end per machine adjusted to finished cost of 9013 lb... $4.675

	Quantity	Prod. per hr.	Hours	Rate	Amount	
Calenders	9730	1000	9.73	$3.00	$29.19	.324
Cutters and layboys	9438	1200	7.86	1.75	13.76	.153
Fan and count	9013	275	32.77	.50	16.39	.182
Total mill cost						$5.334
Packing conversion						.100
						.160
Finished cost						5.594
Shipping cost						.050
Mill cost of sales						$5.644

(For grade analysis administrative cost should be added.)

[1] Obtained from department hourly rate.

The price of broke should be determined by replacement value, its value as compared to other filler stocks, or in other instances the market price, if an excess is made and has to be sold. The main consideration is that the furnish cost with broke included, actually reflects its true value. Further, the accountant must be sure that the quantities of broke called for in the furnishes are equivalent to the amounts actually made in the finishing departments, credit for which is issued on the grade cost statement.

Conversion—Paper Machines

Machine hour rates applied to net production per hour determines cost per 100 pounds for conversion. The machine-hour rate is adjusted for lost or down time not applicable to any specific grade, such as wire or felt changes, repairs, power interruptions, etc. As the operating time actually applicable to each order is reported daily, the summary will show production time to be somewhere between 22 and 23 hours per day average.

Whereas, net machine production may be all that is necessary to determine actual conversion cost, the reasons for and the control of costs are difficult to determine without information on speed, deckle, basis weight, and machine broke. If the information can be used constructively and put into the hands of the executive operating officer, a breakdown of the production per hour into these factors is desirable. Theoretical production can be obtained by the formula: basis weight x deckle x speed x time x 0.001516 = gross production and difference between gross and net is operating broke.

Another machine rate, perhaps not so widely used as the machine hour is the 100-inch hour rate, or the equivalent production on a 100-inch machine, with the same deckle ratio.

Example: 1500 lb./hr. on 100-in. machine = 1500 lb./100-inch hour
1350 lb./hr. on 90-in. machine = 1500 lb./100-inch hour

When production is expressed in these terms, the cost rate is also changed to the same basis so that the cost per 100 pounds determination remains unchanged. The advantage is that machine productive and conversion rates are directly comparable—a step closer towards the presentation of more precise and usable information.

The principal of the hourly rate applies throughout the remainder of the plant. Where machines are not the controlling factor, as in the fanning and counting of the finishing department, man-hours can be used. In such cases time of service men, trucking in and out, etc., is not included—only direct productive hours. Thereby the production per hour as reported is the actual amount of paper *handled* per man-hour, and the rate per hour is adjusted to include all direct expense.

The mill which uses actual costs for control without benefit of standard costs or budgets—uses as a basis of comparison past actuals. I can quote no advantages for the pure actual cost system. Disadvantages are (1) lack of a base from which to evaluate losses in dollars and cents; (2) possibility of losing sight of factors wherein major improvements might be expected; and (3) comparisons of actual costs are inconclusive because as a rule no definite explanation of the variances between such costs is possible.

These points can be shown by an outline of estimated standard costs.

Standard Costs

Before standard costs are compiled and applied, a complete understanding must exist between the executive officer and the cost accountant on the base to be selected. In establishing the standards, straight averages of past performance may be used, but it is questionable that this can be done without including correctable inefficiencies, and it is, therefore, up to the mill manager, under advisement from his operating committee, as to what policy should be used for this base. Items under consideration would be methods of setting production rates per hour, percentage waste, direct expense, effluent losses, etc. A reasonable method to use in setting the standards is to use past averages, eliminating extreme observations and taking cognizance of prospective operating conditions.

The mechanics of building standard costs closely parallel actual costs. Let us assume a 5-day week as standard. The amount of labor required for a balanced 5-day operation is determined. Where man-hours rather than machine-hours are the controlling factor, they can be establishing through the anticipated man-hour production per hour. The accountant should meet with each department head and check amounts for all direct expense items other than labor and supervision. The plant engineer should submit standard distribution of steam and electric. Cost distributions can then be made and the standard grade costs completed for mill conversion.

The next step is to obtain from the purchasing department a schedule of material prices. Anticipated market prices for the ensuing quarter should be used. When I say market, I do not mean spot market. If the company is under contract for bleachable sulphite at a given price, then this price should be construed as the market. Furnishes are extended by these prices, and the standards are complete.

It has been said that standard costs are nearer the actual cost than actual costs are themselves. I believe that the reason for this statement reverts to the fact that they are built on such a large tonnage volume of actual experience.

Idle Time: All elements of conversion can be apportioned to elements of fixed and variable. As departmental standards are constructed, each item is separated under these headings. The "fixed" portion is the expense which must be absorbed whether the plant is operating or idle. The "variable" portion ceases to be an expense during shutdown but must be borne as an expense for a 6th day operation. Both fixed and variable are divided by operating hours to obtain fixed and variable cost per hour. In scheduling labor costs in operating departments, fixed portion is startup and shutdown time. In nonoperating, service centers, and power departments, all labor which is scheduled to report for work whether plant is idle or operating is fixed.

Clerical and Supervision: Salaried employees — 100 fixed hourly employees—same as labor.

Repair Labor: The percentage of fixed cost can be determined through analyzing past maintenance labor costs. Much depends upon company policy, whether there is rigid control on amount of repair labor permitted during down time, or whether there is no schedule on amount of downtime during shutdown. Results can be obtained by plotting time or production against total repair labor cost, to obtain fixed. Same method can be applied to all conversion items. Fixed in repair labor and materials should be between 10-40.

Explanation of Fixed Cost Elements

At the end of each cost period, the total number of operating hours for each department is compared with standard total, and variance plus or minus is recorded. This variance is extended by the fixed hourly rate of that department. The totals of all variances will be the idle or over-absorbed time. If the mill as a whole operates only 18 days per 4-week period fixed cost for two days will have to be absorbed as idle time; if on 24-day operation, the reverse will apply, fixed cost does not have to be absorbed and overabsorbed time results. It's a fancy way of showing that the product is cheaper if the mill can operate 6 days per week.

Two procedures are to be followed with the idle or overabsorbed time. Each departmental period operating expense sheet is adjusted for percentage of operation, which minimizes fluctuations in unit costs and gives opportunity for the department supervisor to better interpret his results.

The second procedure is to debit or credit the clearing account with total amount. Bookkeeping procedure at the close of a period is to charge all department expense and materials to a common or clearing account. Process inventory and other adjustments are also made to this same account, so that its total represents total manufacturing cost. The total idle time is credited (or overabsorbed time debited) to this account, so that if actual operation for the period has not deviated from standard, the

total adjusted manufacturing cost should coincide with the standard costs. To check this point all grades manufactured can be extended by the standard cost per 100 pounds, and when adjustments have been made for work in process, the standards are credited to the clearing account. If the amount is less than the actual cost (adjust for time) the difference represents an underabsorbed burden or substandard operation; if more than actual, overabsorbed burden and better than standard operation. This variance should now be analyzed and broken down into detail of departmental production loss or gain, direct expense, material prices, etc. This analysis gives to the executive a complete picture of the period operating results by spending but a few minutes with the report. The off-setting entry for time and burden may be made directly to the profit and loss account where they become an addition to or a reduction from current cost of sales.

When mill procedures change on any given grade, the cost standard should also be changed, thus minimizing the opportunity for the burden to contain illegitimate variances.

An item of variable cost which may be a matter of interest is: when the variable portion of the department hourly rate is used for determining a product cost it is called a "cash" cost, which is in actuality a misnomer, because although it is all cash, it is not all of the cash which is needed to maintain operations. I know very little about how this thing works that I am going to explain, because I have never found anyone who wants to talk about it, let alone anyone who admits doing it, but apparently when orders are coming in at the rate of 60 per cent of mill operating capacity, when the outlook is none too bright and the other mills keep cutting prices, an order or two may turn up for "E" Grade E.F. It is known that this order cannot be made into anything but a loss, but in reviewing the situation it is found that on a cash-cost basis, $3.00 per ton can be made, so the order is taken. Actually, this only means that if the order is for 20 tons, $60.00 of the mill fixed is regained which otherwise would have to be charged off as idle time.

The theory and practices of budgeting have been presented by many experienced and competent men, and are advocated by many. Some types of business forms have had remarkable results with planned budgeting and forecasting, but this is another phase of mill control which might well be taken up as a separate subject.

This business of operating paper mills at a legitimate profit is continuing to be no small problem, considering the excellent competition which we offer one to the other, and additional demands on profits from labor, federal, state, and local governments. It is, therefore, not amiss that the technical men examine grade costs or burden accounts for a half a day each month or 1% of its working hours. It will find plenty to look at and I can assure you that there are no more lucrative spots to pick up existing losses.

The Importance of Dirt in the Broomed Ends of Pulpwood Bolts

By C. M. Koon[1] and C. H. Keepers[2]

In February, 1939, the Nekoosa-Edwards Paper Company requested The Institute of Paper Chemistry to cooperate in an investigation of the importance of certain factors in wood preparation. Since the numerical results which were obtained apply only to the conditions existing at this particular mill, they will not be presented here; however, it is felt that a description of the attack which was pursued, the difficulties encountered, and the attempts made to eliminate these difficulties may be of general interest. The following discussion has been written at the suggestion of the Nekoosa-Edwards Paper Company.

The broomed ends of pulpwood bolts as discharged from a drum barker might be expected to offer convenient crevices for the lodging of bark and other particles of dirt. To determine whether sulphite pulp from such broomed ends contained more dirt than pulp from the balance of the wood bolt under the conditions of wood handling which prevailed at the coöperator's mill was the objective of the present investigation.

The only special apparatus used was a stainless steel experimental digester equipped for indirect heating and forced circulation. The digester shell consisted of a cylinder welded to a cone, with a perforated false bottom, below which was the outlet leading to the liquor circulating line. The shell had a capacity of 1.3 cu. ft. and an internal diameter of 10 in.

Representative logs were removed from the conveying system as they were discharged from the drum barker. Disks approximately 0.75 in. thick were sawed from the broomed ends of these logs and from undamaged portions nearer the middle. The disks were chipped by means of a chisel into pieces having the approximate dimensions of normal chips. Due to the manner of their preparation, however, the ends of these chips were at right angles to their length, rather than being beveled. The usual shattering effect of commercial chipping was absent, and the chips became nearly airdry before arrangements could be made for cooking them.

Since five species of wood were being studied, and since the hand-chipping operation was a tedious process, it was highly desirable to reduce to a minimum the raw material required. The use of the autoclave described was preferable because it had been found to duplicate the action of commercial digesters more closely than is usually the case with bombs or other small vessels. Accordingly, a method was devised for cooking five samples simultaneously in the same autoclave. The cone was first filled with clean normal chips, loosely packed. One-pound lots of the hand prepared chips were wrapped separately

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in unbleached muslin cloth and were placed in the autoclave one above the other. Closely fitting disks cut from stainless steel wire screen further separated the samples. A strand of stainless steel wire was attached at opposite edges of each disk to aid in the removal of the chip packages after cooking.

The digester was filled to within one inch of the rim with calcium base liquor having the following composition: total SO_2, 7.50%; free SO_2, 6.25%; and combined SO_2, 1.25%. The purpose of the relatively high free sulphur dioxide concentration was to aid in the penetration of the hand prepared chips.

The temperature schedule included a 3-hr. period to 110 deg. C., a 4-hr. period from 110 to 140 deg. C., and a 2.5-hr. period at 140 deg. C. The pressure was allowed to increase until it reached 80 lb. per sq. in., at which point it was maintained by relief for the remainder of the digestion period.

At the end of the cook, the pressure was relieved to zero, and the digester cover was removed. All the bags of chips were intact. Each sample was placed in a pail of warm water, the cloth was removed, the chips were defibered by means of a 5-min. agitation with a laboratory stirrer, and the resulting pulp was washed.

In order to remove the large quantities of shives, a portion of each sample was passed through a 0.010-in. cut laboratory screen. From the screened pulp, 6 by 6-in. sheets were made having an oven-dry basis weight of 32 lb. (25 x 40—500). Filtered water was used in all operation, and new, clean blotters were used in couching and pressing the handsheets.

Chips representing sound and broomed portions of the logs were subjected to the above procedures. The two types of material were digested separately in successive cooks. Since it appeared that the shivey nature of the pulps would offer considerable difficulty in the dirt count determinations, another pair of cooks were made, using an acid of the same composition as before, but the temperature was held at 110 deg. C. for one hour before the sulphonation period was begun, making a total cooking time of 10.5 hr.

Although the chips appeared to have been more thoroughly cooked by this procedure, dark fiber bundles were again present in the handsheets prepared from the screened pulp. This condition could be attributed to several factors. In the first place, the relatively intact structure, particularly of the chips prepared from sound portions of the logs, would tend to impede penetration of the cooking liquor. The rectangular shape and the low moisture content of the chips would also increase their resistance to penetration. The presence of the muslin cloths undoubtedly decreased the rate of liquor circulation. Finally, the disintegration effected by the laboratory stirrer probably was not equivalent to that which would have obtained had it been possible to blow the pulp charge from the digester under pressure.

Since the shivey nature of the pulps was abnormal, it was decided to reduce the shive content by bleaching. Inasmuch as there was insufficient sample to allow a direct determination of bleach requirement, the amounts of bleaching agents used were based upon permanganate number determinations. The various samples were bleached as nearly as possible to the same brightness by two general procedures, one involving a single-stage treatment with hypochlorite, the other involving a three-stage treatment with chlorine, caustic soda, and hypochlorite. Filtered water was again used in all operations.

No consistent differences between the chips from sound and broomed material were observed, either in the permanganate numbers or in the ease of bleaching.

In the procedure which was first used for evaluating the handsheets prepared from these bleached pulps (TAPPI Standard Method T 213 sm-36), dirt is defined as any foreign matter which is embedded in the sheet and which has a marked contrasting color to the rest of the sheet when viewed by transmitted light. Specks which have an equivalent black area of less than 0.03 sq. mm. are ignored, since they are not noticeable except under critical examination. The equivalent black area is defined as the area of a perfectly black spot on a pure white background which would make the same visual impression as does the dirt spot itself on the background in which it is embedded. The black area is estimated by comparing the speck with groups of other specks, having various shapes but of known area, on a standard comparison chart. The results are calculated on the basis of square millimeters of equivalent black area per square meter of surface examined.

Results obtained by this procedure failed to reveal consistent differences between the two types of raw materials being studied, although it was evident that the three-stage bleaching procedure was much more effective in removing the shives.

In order to check both the uniformity of the chip samples and the reproducibility of the procedures, a third pair of cooks was made under the same conditions as those used for the second pair. The pulps were bleached according to the three-stage procedure and the dirt count determinations were made as before. The agreement between the results of the check cooks was very poor. The dirt count ranking appeared to depend largely on the relative amount of shives present in the bleached pulp.

Inasmuch as the experimental pulps were not comparable with pulps which might be expected from normal cooks on commercial chips, it was decided to modify the dirt estimation procedure by not counting the shives at all. On the basis of this modified technique, the ranking of the various samples was more consistent, and the unbroomed ends with few exceptions gave cleaner pulps than did the broomed ends. It was felt that it was valid to disregard the shives in interpreting the results, for none of the measures which were taken to eliminate them produced a pulp, even from the unbroomed material, which would be comparable with commercial sulphite pulp in shive content.

Summary

Hand-prepared chips from broomed and unbroomed ends of pulpwood bolts have been pulped experimentally by the sulphite process. The shivey nature of these pulps, even after screening and bleaching, complicated the estimation of dirt by the standard procedure. Disregarding the shives, however, the data indicated that samples of chips from broomed ends in most cases gave pulp of higher dirt content.

Acknowledgment

The writers wish to express their thanks to those members of the technical staffs of the Nekoosa-Edwards Paper Company and of The Institute of Paper Chemistry by whom the experimental work was performed.

Some Observations on the Effect of Alum on Certain Sheet Properties of Paper*

By E. L. Keller[1], F. A. Simmonds[1] and P. K. Baird[1]

Abstract

Laboratory-scale experiments with test sheets and machine-made paper indicated that alum flocs, when formed in sufficient quantity in the furnish, have a deleterious effect on the strength of paper. These flocs result from the reaction of the alum with such hydroxides and bicarbonates as occur in natural waters. The amount of floc formed depends chiefly on the amount of these constituents in the water used in a furnish and the amount of alum added thereto. According to available information the composition of such flocs varies from hydrated alumina to basic aluminum sulphates, depending on the hydrogen ion concentration at which they are formed. The indicated trends were that as the bicarbonate content of the fresh water used in a particular furnish increased, thus necessitating an increase in the amount of alum added to the stuff to maintain a desired pH value of 4.5, the amount of floc formed and subsequently retained by the paper increased. As a result of this increase in mineral content, the strength properties of the papers, other than tearing strength, decreased. Thus in instances of unexplained strength losses, particularly in papers made at high hydrogen ion concentrations, the possibility of alum flocs being the cause should be determined by suitable experiments.

In the production of "point per pound" kraft wrapper and also bond paper from bleached sulphate pulps at the Forest Products Laboratory, serious strength losses occurred when the furnishes were sized with rosin. Test sheets made from the same furnishes also showed a drop in strength. When, however, unsized furnishes of the unbleached kraft pulps were put over the machine there was no difficulty in even exceeding a bursting strength standard of a point per pound per ream on a 25 by 40-500 basis. In no instance did a sized sheet come up to minimum standard strength.

It first appeared likely that the cause of the observed strength loss was due to faulty sizing conditions since the magnitude of the loss was abnormal. Several series of experiments with test sheets were therefore made with sufficient variations of furnish composition and condition to test this assumption. The results of these tests are described here to illustrate the factors causing the loss in strength of the papers which had been made under experimental conditions and to indicate their practical significance. *p*H 4.5, at which the rosin size was precipitated and

Sizing *p*H and Bursting Strength of Kraft Wrapper Stock

In order to determine if the loss in sheet strength was due to the H-ion concentration, equivalent to the furnish run on the machine, a series of test sheets were made using various combinations of size and alum and also process water.

These tests showed that even when alum only was added to the kraft furnishes made with both hard and zeolite softened water, a loss in sheet strength resulted, apparently depending on the quantity of alum added. For example, the addition of enough alum to yield a *p*H of 4.5 caused a 25 per cent loss in bursting strength with reference to the waterleaf sheet.

In addition, the results established the fact that only a negligible further strength loss occurred when both size and alum were added to the furnish. It was therefore indicated that the cause was confined to reactions occurring in the pulp-water-alum system.

The use of distilled water as a process water, with the purpose of factoring out possible effects of those soluble constituents present in natural waters, showed that the addition of sufficient alum to a furnish at the consistence obtaining in the deckle box of the sheet machine (0.05 per cent) to yield a *p*H of 4.5 could cause as much as a 50 per cent reduction in bursting strength. If, however, the *p*H was adjusted to 4.5 at a consistence of 3 per cent with alum and then no more alum added to the suspension in the deckle box, the sheet strength was not lowered. Yet this latter amount of alum when applied in the presence of either hard or softened water resulted in a measurable strength loss.

The obvious possible causes of the strength loss suggested by the foregoing results were: the alum, the degree of acidity due to the hydrolysis of the alum, the combined effect of the alum and the dissolved components of the process water, or combinations of these factors.

These possible effects of alum in papermaking operations have received but little mention in the literature. H. Ellern-Eichmann *(1)* reported small increases in the tensile strength of test sheets from unbleached sulphite stuffs, not less than 500 cc. in freeness (S.-R.), when sized with 2.2 per cent rosin, as much as 6 per cent alum and using process water rated at 197 p.p.m. calcium carbonate. When, however, larger amounts of alum were added the tensile strength was decreased appreciably below that of the untreated stuff. In an experiment with 32 per cent alum and no size, he did not observe any loss in tensile strength when the alum was added to the suspension previously acidified to *p*H 5; however, there was an appreciable loss when the alum was added to the unacidified suspension. In the latter case the ash content of the test sheets were increased but not in the former. He concluded the loss in tensile strength to be a function of the amount of alumina adsorbed and the loss appreciable only when the amount is 2.5 per cent or more of the weight of the paper. He did not extend these experiments to cover floc conditions

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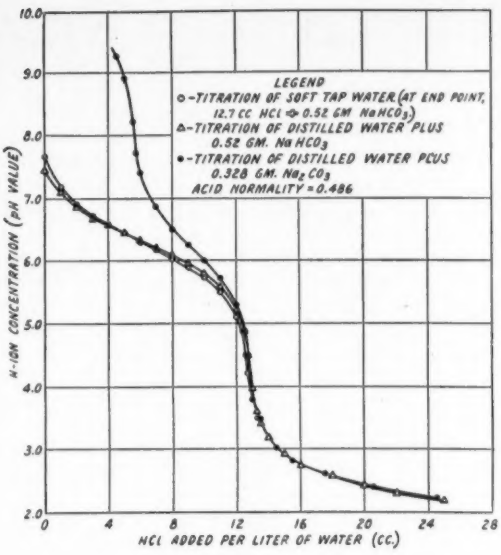


FIG. 1
Titration of Three Waters with Hydrochloric Acid

under variations in the alkalinity of the process water which is of immediate concern in practical stuff preparation.

Some time after our experiments were completed, a relevant statement by P. H. Prior was found in his discussion of an article dealing with the control of sulphite pulp quality *(2)*. He said: "One point comes up in attempting to imitate the paper machine, and that is the *p*H value of the water. Fresh water is usually distinctly alkaline, and it was thought at one time to acidify the stock with alum as in the mill (of course a closed-in system does not contain much fresh water). The result was a decrease in strength of 50 per cent; the same *p*H reached with sulphuric acid did not give any decrease. The probability is that alumina was deposited on the fibers, and this is confirmed by the increase in ash content."

The Constituent of the Hard and Softened Process Waters Reacting with Alum

The three titration curves in Fig. 1 show sodium bicarbonate to be the constituent of the softened water mainly responsible for the consumption of acid. This is true because the curve for the softened water is coincidental with the curve for the distilled water containing a weight of sodium bicarbonate equivalent to that calculated to be present in the softened water, the calculation being based on the titration of the softened water with hydrochloric acid. Similarly, the sodium bicarbonate in the softened water is responsible for the consumption of alum.

The uppermost curve in Fig. 1 resulted from titrating, in distilled water, a weight of sodium carbonate equivalent to the weight of sodium bicarbonate used in the titration just mentioned. It is evident that the titration curve for the sodium carbonate does not coincide with those for the softened water and the distilled water containing sodium bicarbonate until the sodium carbonate is converted to the bicarbonate.

It was found also that alum titration curves for both hard and softened water were coincidental. Since the zeolite softener has no effect on the bicarbonate ion, merely replacing calcium and magnesium with sodium, the reaction of alum with the bicarbonate in the process waters is thus confirmed.

TABLE I.—ALKALINITY OF SEVERAL WISCONSIN RAW AND TREATED PROCESS WATERS

Source and mill	Alkalinity of raw water As p.p.m. $CaCO_3$	Treatment used Lb. of chemical per million gal. water	Alkalinity after treatment As p.p.m. $CaCO_3$
Wisconsin River			
Mosinee	27	none	..
Consolidated	...	700-800 (alum)	11
Marathon	28	none	..
Tomahawk	28	none	..
Rhinelander	...	380 (alum)	8
		34 (lime)	
Brokaw	...	520 (alum)	2
		23 (lime)	
Well			
Whiting Plover	11	none	..
Marathon	60	none	..
Hoberg	145	none	..
Nepco Lake	127	350-700 (alum)	78
Menominee River			
Hoskins	91	none	..
Badger	93	none	..
Peshtigo River	93	none	..
Fox River			
Thilmany	120	none	..
Hoberg	119	none	..
John Strange	115	none	..
Gilbert	...	1060 (alum)	90
Madison City wells	297	zeolite	310

Alkalinity of the Softened Water and Alum Floc

The alkalinity of the softened water was found to be 310 p.p.m., calculated as calcium carbonate. This is a high alkalinity and accounts for the voluminous floc formed upon the addition of a sufficient quantity of alum. The use of alum as a flocculating agent in the treatment of mill waters is, of course, common practice. In the preparation of furnishes at a specified *p*H value, the higher the alkalinity of the process water, the greater will be the amount of alum required and, consequently, the greater the amount of floc formed. According to available information *(3)* the composition of such flocs varies from hydrated alumina to basic aluminum sulphate, depending on the hydrogen ion concentration at which they are formed.

For purposes of comparison a brief survey was

TABLE II.—EFFECT OF ALUM AND SOFTENED WATER ON CERTAIN PROPERTIES OF BLEACHED SULPHATE PULP TEST SHEETS

Composition of furnish used for test sheets[1]	Ash %	Sheet properties: Double folds Number	Bursting strength Pts./lb./rm. 25x40-500	Tearing strength G./lb./rm. 25x40-500	Opacity (contrast ratio) %	Ream weight Lb. 25x40-500	Thickness mils.
Stuff only	0.7	430	0.74	1.49	74.5	52.0	4.9
Stuff plus alum to pH 4.5	4.0	23	.47	1.90	79.8	52.6	4.9
Stuff plus 1.1% rosin size and alum to pH 4.5	3.7	15	.43	2.10	80.0	51.3	4.7
Stuff plus 1.1% rosin size, 1% titanox, and alum to pH 4.5 in order named	3.9	17	.41	2.13	81.0	52.6	4.8
Stuff plus 1% of titanox, 1.1% rosin size, and alum to pH 4.5 in order named	4.0	12	.41	2.10	81.0	52.0	4.7
Stuff plus 1% titanox and alum to pH 4.5	4.4	17	.41	1.80	81.6	51.6	4.7

[1] The hydrogen ion concentration was adjusted at a consistence of about 0.3 per cent and no more alum was added when the furnishes were diluted to 0.05 per cent consistence in the deckle box of the sheet machine in all instances except in the first, where stuff only was used.

made of the alkalinity of mill process waters, both raw and treated, at various points in the Wisconsin papermaking areas. These data, recorded in Table I, illustrate clearly the exceptionally high alkalinity of Madison well water and softened waters used in the experimental paper mill at the Laboratory.

Effects of Alum and the Softened Water on the Sheet Properties of a Bleached Sulphate Bond Furnish

The strength difficulties encountered with the bleached sulphate bond furnishes, previously mentioned, related primarily to the attainment of a specified folding strength while attempting to maintain opacity. Since the opacity of bleached sulphite pulps is somewhat lower than that of bleached sulphite pulps and is reduced rapidly by processing, it is not feasible to develop the folding strength to an appreciably higher value than required in order to compensate for any subsequent factors causing a loss in strength.

The data in Table II dealing with the strength of test sheets made from a bleached sulphate pulp using softened water and variations in other furnish components show an excessive drop in folding strength when alum alone was added in sufficient quantity to lower the *p*H to 4.5. The bursting strength was reduced 32 per cent. As was the case with the unbleached sulphate pulp, the addition of rosin size with alum caused only a negligible further decrease in the bursting and folding strengths.

The tearing strength was increased by the addition of alum and also alum plus the other furnish components. The significance of this fact with respect to the mechanism of tearing strength is not known but it appears to be worthy of investigation.

The values for the ash contents of the sheets prepared with alum and also with alum plus other furnish components show the mineral content was increased about five times. It was therefore indicated that the retained floc was most likely the cause of the observed strength changes, with the acid introduced in the systems by the alum as either an alternative or supplementary cause.

The possible effect of acid at *p*H 4.5 on strength was found, in general, to be negligible. The greatest effect was observed in the case of the folding strength of a bleached sulphate furnish wherein a drop from 700 to 500 double folds resulted when either hydrochloric or sulphuric acid was added in sufficient amount to lower the *p*H to 4.5. The bursting strength was not affected appreciably. As *p*H values are decreased with the addition of greater amounts of acid, deleterious effects on strength occur which appear due entirely to acid. It is obvious, of course, that given a sufficiently high concentration of acid the cellulose itself would be destroyed.

Since it is always important to know if results obtained with test sheets are applicable to machine-made papers, two machine runs were made with bleached sulphate pulp furnishes. One of these was made with untreated softened water and the other with bicarbonate-free softened water. The bicarbonate radical of the sodium bicarbonate present in the softened water was removed by adding sulphuric acid to produce a *p*H of 4 and then agitating the water for an hour in order to complete the decomposition of the carbonic acid. The *p*H of the water was then adjusted with sodium hydroxide to approximately 7.

To each furnish were added 1 per cent Titanox, 1.1 per cent rosin size, and sufficient alum to lower

TABLE III.—VARIATION IN SHEET PROPERTIES WITH VARIATIONS IN THE ALKALINITY OF THE PROCESS WATER AND THE AMOUNT OF ALUM ADDED TO A pH OF 4.5

Key number	Process water	Amount of alkalinity in terms of $CaCO_3$ (calculated on weight of moisture-free pulp) %	Amount of alum added (calculated on weight of moisture-free pulp) %	Consistence at which alum was added %	H-ion concentration after addition of alum and at sheet formation pH	Sheet properties: Double folds Number	Bursting strength Pts./lb./ream 25x40-500	Tearing strength G./lb./ream 25x40-500	Tensile strength Lb./sq. in.	Solid fraction	Ash content %
	Beaten, unbleached, sulphate pulp, Schopper-Riegler freeness 750 cc.										
KO1	Softened	59.0	none	...	7.5	1,810	1.10	1.93	6,000	0.43	...
KO2	do	59.0	none	...	7.5	1,830	1.04	1.99	6,200	.43	...
	Average	...	...	...	7.5	1,820	1.07	1.96	6,100	.43	1.00
KC1	Softened plus distilled	0.4	2.4	3.40	4.5	1,530	0.90	2.02	4,700	.42	1.36
KC2	do	0.4	2.4	3.40	4.5	1,480	0.91	2.06	5,100	.41	1.27
KB1	Softened plus distilled	0.8	3.6	3.40	4.5	1,450	0.90	2.03	5,300	.42	1.44
KB2	do	0.8	3.5	3.40	4.5	1,450	0.90	2.02	4,600	.42	1.40
	Average	0.8	3.6	3.40	4.5	1,450	0.90	2.03	4,950	.42	1.42
KA	Softened plus distilled	2.0	6.8	1.50	4.5	850	0.81	2.03	4,700	.42	1.94
K1	do	6.3	14.0	0.06	4.5	250	0.67	2.07	4,500	.41	2.20
K30	do	9.7	24.0	0.06	4.5	40	0.39	2.26	3,700	.43	3.20
K2	Distilled	[1] 4.6	12.5	0.06	4.5	720	0.78	1.99	4,500	.42	1.75
K3	do	[1] 4.6	4.5	3.40	4.4	1,190	0.86	2.05	5,200	.43	1.31
K6	([2])	0	([3])	0.06	4.7	1,123	0.80	2.05	4,720	.42	1.12
	Beaten, bleached, sulphite pulp, Schopper-Riegler freeness 630 cc.										
SO1	Softened	59.0	none	...	7.5	320	0.77	0.99	5,470	.48	...
SO2	do	59.0	none	...	7.5	320	0.76	1.01	5,800	.48	...
	Average	...	...	...	7.5	320	0.77	1.00	5,640	.48	0.85
SC1	Softened plus distilled	0.4	1.8	3.40	4.4	280	0.69	0.96	5,300	.46	1.18
SC2	do	0.4	1.6	3.40	4.5	320	0.72	0.98	5,200	.46	1.15
	Average	0.4	1.7	3.40	4.5	300	0.71	0.97	5,250	.46	1.17
SB1	Softened plus distilled	0.8	2.4	3.40	4.5	230	0.71	0.95	4,700	.45	1.21
SB2	do	0.8	2.5	3.40	4.5	280	0.72	0.95	5,300	.46	1.27
	Average	0.8	2.5	3.40	4.5	255	0.72	0.95	5,000	.46	1.24
SA1	Softened plus distilled	6.3	5.7	1.50	4.5	130	0.60	0.98	4,300	.45	1.66
S30	do	9.7	22.0	0.06	4.5	20	0.39	1.11	3,400	.47	3.40

[1] Equivalent to the amount of carbon dioxide in the distilled water, the pH of which is usually between 5 and 6.
[2] The process water was the supernatant water from softened water after the latter had been flocculated with alum at pH 4.5 and the floc allowed to settle. This process water required the equivalent of 1 lb. NaOH per 1,000 gal. to neutralize the acid present. Aluminum and sulphate ions were also present.
[3] Although no alum was added during the furnish preparation there was, of course, alum in solution in the supernatant water.

the *p*H to 4.5 at a consistence of about 2 per cent. The furnish made with water free from bicarbonates required 2 per cent alum and the other, 3 per cent. When the alkalinity of the softened water containing bicarbonates was calculated as a weight of calcium carbonate, as is customary, this amount was about 2 per cent of the weight of the pulp used in the furnish.

Both furnishes were run on the paper machine at a *p*H of 4.5. The properties of the resultant papers were, in general, in accord with those of the test sheets. For example, the folding strength and ash content of the paper made with the process water containing bicarbonates were 254 double folds and 2.3 per cent, respectively. Corresponding values for the paper made with bicarbonate-free process water were 452 and 1.5, respectively.

Variation of Strength with Variation in Alkalinity of Process Water

It has been indicated that alum reacts with alkaline constituents of process waters to form a floc that is retained to some degree in sheets formed from the furnish and, at *p*H values down to 4.5, this retained floc rather than hydrogen ion concentration is the cause of decreased sheet strength.

The data in Table III, shown graphically in Figs. 2 to 5, were taken to indicate the variation in alum requirement for a *p*H of 4.5 at various alkalinities of process water and the resultant variations in sheet properties.

The alkalinity of the process water was varied by using different proportions of the softened water, 310 p.p.m. alkalinity as $CaCO_3$, and distilled water. As a result of this procedure, the consistence of the furnishes varied from 0.06 to 3.40 per cent at the point of alum addition. The distilled water contained dissolved carbon dioxide which, as carbonic acid, will react with alum. The CO_2 content calculated as $CaCO_3$ was 36 p.p.m. This value was taken into consideration in the values recorded in Table III.

Sufficient alum was added in each instance to lower the *p*H value to 4.5 as measured with a glass electrode. After 10 min. a second adjustment of *p*H was made to compensate for an upward drift, whereupon the *p*H value of the systems remained constant up to the time of sheet formation. These suspensions were allowed to stand for a total time of 1 hr. prior to sheet formation to assure equilibrium conditions.

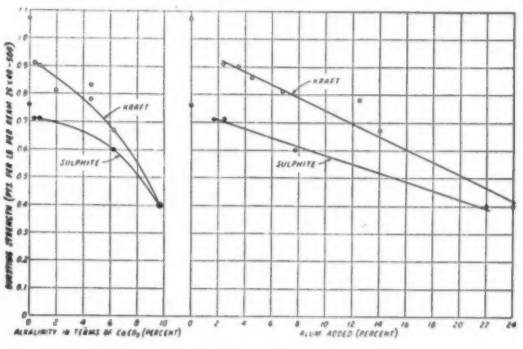


FIG. 2

Relation of Bursting Strength of Test Sheets to the Alkalinity of the Water and the Corresponding Amount of Alum Added to a pH of 4.5 (Calculated on Basis of the Weight of Moisture-Free Pulp)

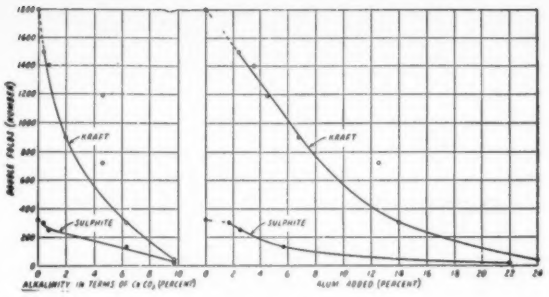


FIG. 3

Relation of Folding Strength of Test Sheets to the Alkalinity of the Water and the Corresponding Amount of Alum Added to a pH of 4.5. (Calculated on the Basis of the Weight of Moisture-Free Pulp)

The formation consistence in the deckle box of the sheet machine was 0.06 per cent. Whenever the consistence of the suspensions prior to sheet formation was more than 0.06 per cent the suspensions were diluted with distilled water, the *p*H of which had been lowered to 4.5 with sulphuric acid.

In Fig. 2 the bursting strength is related in one graph to the amount of alkalinity in the process water expressed in terms of calcium carbonate, which has been calculated as a percentage of the weight of moisture-free pulp and, in the other graph, to the amount of alum added. The two graphs thus show that as the amount of alkalinity increased the amount of alum required to obtain a *p*H of 4.5 increased. The curves also illustrate that the bursting strength of both the sulphate and sulphite stuffs decreased with increasing alkalinity. In the case of the sulphate pulp an alkalinity equivalent to 0.4 per cent calcium carbonate on the weight of pulp caused the bursting strength to drop below a point per pound per ream. The magnitude of the effect was less in the case of the sulphite pulp.

Folding strength also decreased with increasing alkalinity with the effect again smaller in the case of the sulphite pulp, as is shown in Fig. 3. The tensile strength of the sulphate pulp decreased to a greater extent than did that of the sulphite pulp as would be expected from the effect on the bursting strength. Tearing strength was not appreciably affected in either of these two series. It will be recalled that in the case of a bleached sulphate furnish, tearing strength was definitely increased under conditions that resulted in practically a complete loss in folding strength.

The increase of the ash content of the two stuffs with increasing alkalinity of the process water is shown by Fig. 4. Then in Fig. 5 the drop in folding strength is shown to depend on increasing ash content of the sheet.

This latter correlation refers to the conditions obtaining for the main body of tests. Were these to be varied, it is likely that another curve would result. This is indicated by the two points for the sulphate pulp Fig. 5 indicating folding strengths of 1,190 and 1,123 double folds. The first point represents a furnish made with distilled water to which 4.5 per cent alum was added at a consistence of 3.4 per cent. The *p*H of the suspension in the deckle box was subsequently adjusted to 4.5 with sulphuric acid. The ash content of these sheets was 1.12 per cent. When the folding strength of 1,123 is compared with the curve for the sulphate pulp in Fig. 5 it appears much too

low for the ash content. The second point represents a furnish made with a process water that was the supernatant water from softened water after it had been flocculated with alum at *p*H 4.5 and the floc allowed to settle. Again the folding strength is low for the ash content of 1.3 per cent when compared with the curve. Since there was no visible floc in this process water the stuff apparently adsorbed aluminum ions or alumina from the solution of aluminum sulphate which the process water comprised.

The reason that the magnitude of the observed effects on strength was greater for the sulphate pulp than for the sulphite may be the inherent differences in the nature of the two pulps or that the strength of the sulphate was considerably greater than that of the sulphite. Since the increase in ash content at corresponding degrees of alkalinity of process water was practically the same for both stuffs it appears that the smaller strength loss of the sulphite pulp was because it was inherently the weaker.

Practical Implications

The foregoing results suggest that, when operating at a *p*H of 4.5, the use of process water with a total alkalinity equivalent to a weight of calcium carbonate amounting to 0.8 per cent by weight of the pulp will result in a measurable, although small, loss in strength. These conditions might be termed a threshold value or the beginning of the zone of strength loss.

As a specific example applicable to practice, consider the Fox River water with an alkalinity of 120 p.p.m. as calcium carbonate. If 16,000 gal. of this water were used per ton of pulp and the *p*H of the furnish was held at 4.5 with alum, a small strength loss would probably result. If however the *p*H were 6, there would be an insufficient amount of floc formed to affect the strength.

In addition it should be recalled that a strength loss occurred when test sheets were formed in the presence of distilled water and a relatively large amount of alum and also when the supernatant water from flocculated softened water was used as the process water. This indicates that a white water, high in alum content, may also have a deleterious effect on strength.

There is a third possibility, quite apart from the alkalinity of the process water, where the alkalinity-alum relationship may affect strength. For example, an instance has been called to our attention of the occasional inability on the part of a mill to meet a

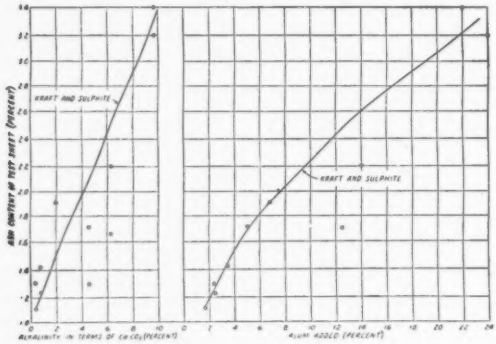


FIG. 4.
Relation of Ash in Test Sheets to the Alkalinity of the Water and the Corresponding Amount of Alum Added to a pH of 4.5. (Calculated on Basis of the Weight of Moisture-Free Pulp)

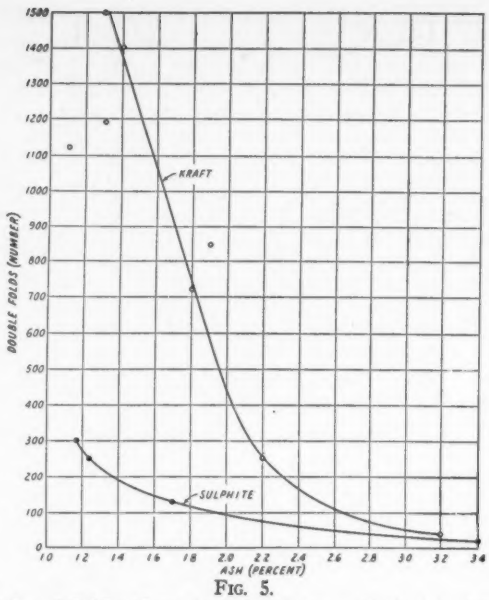


FIG. 5.
Relation of Folding Strength of Test Sheets to Their Ash Content

strength specification in the production of a kraft sheet which had also to be run to a *p*H specification relatively low for kraft. At such times the alum demand for this particular *p*H value was considerably higher than normal. The apparent explanation is, of course, that the stock came through the washing treatment with more than the normal amount of residual alkali. This increased the alum demand and the subsequent floc formation to an extent sufficient to affect the strength adversely.

Conclusions

The reaction between alum and the bicarbonates and hydroxides occurring in natural waters results in a floc which, if formed in sufficient quantity in a furnish, is retained by the paper with a consequent loss in strength. The amount of floc formed depends chiefly on the amount of these constituents in the water used in a furnish and the amount of alum added thereto.

It appears that as the bicarbonate content (alkalinity) of the fresh water used in a particular furnish increases, thus necessitating an increase in the amount of alum added to maintain a constant *p*H value of 4.5, the amount of floc formed and retained by the paper increases.

Aside from alum-alkali reactions it was indicated that relatively large amounts of alum alone, such as might be present in white water, when added to a furnish has a deleterious effect on sheet strength.

In instances of unexplained strength losses in mill operation it is suggested that the possibility of the factors enumerated herein being the cause should be examined.

Literature Cited

(1) The relationship between sheet strength and sizing in unbleached pulp. *Papier-Fabr.* 31:197-201; 209-13; 223-26 (1933).
(2) Lampén, A. Quality control in the sulphite industry. *Proc. Tech. Section, Paper Makers' Assoc. Gt. Britain & Ireland* 9, part I, 4-21 (1928).
(3) Miller, Lewis B. The fundamental chemistry of alum and its application to paper manufacture. *Paper Trade J.* 108, no. 2:34-40 (Jan. 12, 1939); *Tech. Assoc. Papers* 22:141-147; discussion, 90-92 (June, 1939).

Imports of Paper and Paper Making Stock

Giving Manifests of New York, Boston, Philadelphia and Other Ports of Newsprint, Wrapping, Writing, Coated, Blotting, Tissue, Strawboard; Bleached Sulphite More Acute—Some Grades of Old Waste Lower.

NEW YORK IMPORTS

WEEK ENDING DECEMBER 28, 1940

SUMMARY

Cigarette paper .....187 cs.
Paper hangings .....40 bls.
Newsprint .....863 rolls
Filter paper .....1 cs.
Decalcomania paper .....27 cs.
Tissue paper .....27 bbls., 5 cs.
Photo paper .....67 cs.
Cardboard .....2 cs.

CIGARETTE PAPER

Rohner Gehrig & Co., ——, Petsamo, 187 cs.

PAPER HANGINGS

W. H. S. Lloyd & Co., ——, Liverpool, 40 bls.

NEWSPRINT

——, ——, Corner Brook, 863 rolls.

FILTER PAPER

H. Reeve Angel & Co., Inc., ——, Liverpool, 1 cs.

DECALCOMANIA PAPER

B. F. Drakenfeld & Co., ——, Liverpool, 21 cs. (duplex), 6 cs. (simplex)

TISSUE PAPER

B. F. Drakenfeld & Co., ——, Liverpool, 5 cs.
H. M. Storms Co., ——, Petsamo, 27 bbls.

PHOTO PAPER

Medo Photo-Supply Co., ——, Liverpool, 1 cs.
——, ——, Liverpool, 66 cs.

CARDBOARD

——, ——, Liverpool, 2 cs.

RAGS, BAGGINGS, ETC.

S. Godfrey Co., Inc., ——, Buenos Aires, 24 bls. old rags.
——, ——, Buenos Aires, 150 bls. cotton linters.
Richard Shipping Co., ——, Santos, 15 bls. rags.
——, ——, Liverpool, 155 bls. rags.
Camden Fibre Mills, ——, Bombay, 400 bls. cotton waste.
Green Textile Associates, ——, Bombay, 300 bls. cotton waste.
C. Katz, ——, Bombay, 300 bls. cotton waste.
——, ——, Havana, 13 bls. rags.
E. J. Keller Co., Inc., ——, Bombay, 200 bls. jute rags.
Camden Fibre Mills, ——, Bombay, 200 bls. cotton waste.
L. Ayres, ——, Bombay, 200 bls. cotton waste.
W. Inter, ——, Bombay, 205 bls. cotton waste.

OLD ROPE

——, ——, Cristobal, 2 bdls.

HIDE CUTTINGS

——, ——, Liverpool, 320 bags.
——, ——, Liverpool, 435 bags.

CASEIN

American British Chemical Supplies, ——, Buenos Aires, 834 bags.
Chase National Bank, ——, Buenos Aires, 834 bags.
A. Hurst & Co., ——, Buenos Aires, 417 bags.
National City Bank, ——, Buenos Aires, 1,668 bags.
American British Chemical Supplies, ——, Buenos Aires, 2,200 bags 110,000 kilos.

WOOD PULP BOARDS

Johaneson Wales & Sparre, Inc., ——, Petsamo, 417 rolls.

LOS ANGELES IMPORTS

WEEK ENDING DECEMBER 28, 1940

——, ——, Yokohama, 171 tons rags, 3 bls. hanging paper.
——, ——, Powell River, 1,936 pkgs. newsprint.
——, ——, Shanghai, 89 tons rags.
——, ——, Osaka, 9 cs. coated tissue paper.

Jewish Charities to Hold Banquet Jan. 8

A dinner sponsored by leaders of the paper and pulp industry on behalf of the New York and Brooklyn Federations of Jewish Charities will be held Wednesday evening, January 8, at 6:30 P. M., at the Essex House, 160 Central Park South, it was announced by Morris Gintzler of the Pulp and Paper Trading Company, chairman of the event. Isaac Gilman of the Gilman Paper Company, and Henry Nias of the Lily Tulip Cup Corp., are serving as honorary chairmen.

Wide interest is being aroused throughout the industry for the affair and it is expected that this year's dinner should surpass by far any previous effort by the industry on behalf of the home charities, the chairman stated.

"The paper and pulp industry is always among the first to organize for helping the 116 Federation health and welfare institutions," Mr. Gintzler declared. "This year we all feel moved to do something more for these philanthropic agencies that represent so much that is fine in our American way of life."

"Separate committees are also being organized in other branches of the industry to secure the widest possible cooperation with the annual dinner, which this year, as usual, will serve as the dramatic highlight in the industry's effort to rally support for the 116 hospitals, orphanages, homes for the aged, family welfare and other agencies affiliated with the two Federations," Mr. Gintzler said.

Abraham Mazer, Hudson Pulp and Paper Corporation, is co-chairman of the dinner committee, and Milton Collier, president of the Pennsylvania Exchange Bank, is treasurer. Vice-chairmen representing bag manufacturers are William Salzman, Brooklyn, Standard Bag Company, and Al Newman, Newman-Kohn Paper Company. Vice-chairmen representing wrapping paper jobbers are Jack Weill, Mutual Paper Company, and Joseph Simon, Ace Paper Company.

Other vice-chairmen include: Paper and bag jobbers, Hyman Schrier, Schrier Brothers, and Isaac Schrier, Schrier Brothers; Cosmopolitan Twine and Paper Association, Meyer Schwartz, Harlem Paper Products Company, and David Kasson, Cosmopolitan Twine and Paper Association; paper box division, Jacob Sincoff, Empire Box Board Company.

On the sponsoring committee are Jerome J. Altman, Jack Andersen, Sol Ash, Charles Ballin, Reuben Barshay, J. M. Berger, Howard L. Bergman, Abraham H. Cohen, Philip Dobler, W. J. Eisner, Bernard Feldman, Max A. Finkel, Nathan Frankel, Jacob Galewitz, Jacob S. Glekel, Morris Gold, D. Samuel Gottesman, Morris Heller, Morris Katz, Benjamin Kushel, Joseph Mazer, William Mazer, Bertram Obst, Michael Posner, Nathan A. Rothstein, Robert Rudnick, Al. Scharf, Emanuel Schorsch, I. H. Shapiro, Bernard Sharp, Frank Shavitz, Benjamin I. Sheldon, Louis Silfen, I. F. Stein, George Stoll, L. A. Tishler, David Usdan, Max L. Weill and Jack Weill.

New York Paper and Pulp Market Review

Kraft Wrapping Paper Leads Market In Activity — All Paper Prices Firm and Unchanged — Good Grades of Unbleached Sulphite and Northern Unbleached Kraft Pulp Scarce — Other News.

Office of the PAPER TRADE JOURNAL,
Tuesday, December 31, 1940.

Wholesale sales in the paper market are currently reported by many manufacturers' representatives, jobbers, and general paper merchants at about 5 per cent lower in volume than at this date last year. Some lines in kraft and paper board reflect more activity than the market average. The general business outlook is, of course, the best in years, with competent authority forecasting a new high record for industrial activity in 1941.

The general price situation is being considered by government and business economists with some concern. It is thought that the price control measures embodied in present interstate trade regulations will suffice to keep prices from either rising too rapidly or too high. The dangers inherent in substantial inflation are necessarily present in any boom-like acceleration of production and trade, but no adverse effects, with run-away prices, are now considered as likely to occur. A moderate upward revision in the prices of most consumer goods, included many lines of paper, is generally indicated by the firmer tone and uptrend in commodity prices.

The index of general business activity rose to 115.7 per cent for the week ended December 21, from 115.1 per cent for the preceding week, compared with 105.7 per cent for the corresponding week last year.

Paper production of 192 mills for the week ended December 21 was estimated at 90.8 per cent, compared with 97.2 per cent for 1939, with 77.6 per cent for 1938, with 48.6 per cent for 1937, and with 66.5 per cent for the corresponding week for 1936.

Paper board production for the week ended December 21 was 80.0 per cent, compared with 81.0 per cent for 1939, with 69.0 per cent for 1938, with 48.0 per cent for 1937, and with 63.0 per cent for the corresponding week for 1936.

Newsprint prices for 1941 will be continued unchanged for the first quarter according to announcements made by the International and Abitibi companies. Capacity production is expected for domestic mills, but late reports reflect the opinion that a substantial capacity of Canadian mills may not be used, owing to the drastic curtailment of pages in newspapers published in Great Britain.

Mechanical Pulp

The market situation in mechanical pulp continues satisfactory, with prices firm under a good demand. The outlook for this grade of wood pulp is for a rising consumption as general business activity increases. No indication of any change from current prices is reflected in reports received this week.

Chemical Pulp

The chemical pulp market is reported firmer this week. From some quarters of the trade reports indicate that the better grades of unbleached sulphite and also prime grades of northern unbleached sulphate pulp, are rather scarce. The market position in other grades of chemical wood pulp continues unchanged, with more firmness noted in the news grade of unbleached sulphite, in light and strong and in No. 1 kraft pulps.

Imports of 1,925 bales of sulphite pulp and 3,534 bales of sulphate pulp are reported in the cargo of the steamship *Esbjorn* from Finland, which docked on December 27. Also included were 353 rolls of newsprint, 1,310 rolls and 1,000 cases of wrapping paper and 615 cases of cigarette paper.

Rags

Mill demand for a limited number of the higher grades of cotton rags is reported moderate this week, as buying is kept down to a minimum just prior to annual inventories. Prices are unchange.

Old Rope and Bagging

Old No. 1 Manila rope continues very firm, under a steady demand from mills, with supplies limited. No change from prevailing prices has been reported this week, excepting on jute threads, currently quoted at from 2.75 to 3.00.

Trading activity in old bagging is reported moderate to good at this date. This market is firm and prices unchanged.

Old Waste Paper

Fair activity is reported in the paper stock market at this date, which is seasonally quiet. The general tone of the market continues a little weak, with prices on old corrugated rather soft. Some slight downward revisions from current prices on the lower grades, such as No. 1 mixed paper, is expected in some quarters of the trade.

Twine

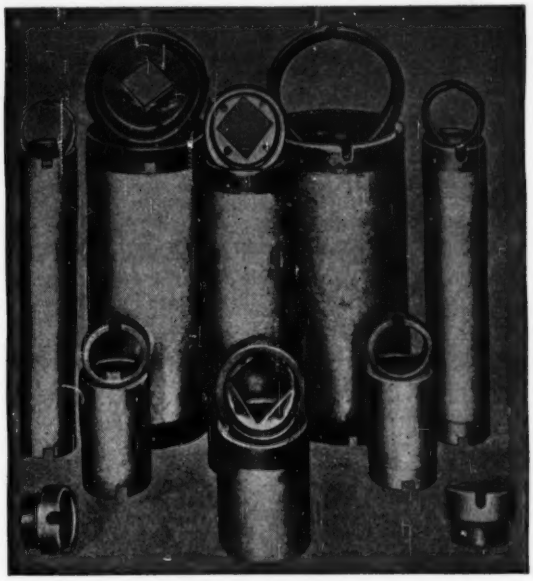
The twine market is seasonally quiet. Prices on the whole are firm and a more active market is looked for in the trade early in 1941. The outlook is excellent. Prices in general, on most grades of hard and soft fiber twines, are relatively firm.

Southern Kraft Buys Tissue Co.

[FROM OUR REGULAR CORRESPONDENT]

The Southern Kraft Corporation was the successful bidder on December 24 at $501,000 for the Glen Falls, N. Y., and Marinette, Wis., properties of International Tissue Corporation, a subsidiary of International Paper Company, according to a press dispatch. International Paper also controls Southern Kraft.

The purchase included inventories and lists of customers as well as patent rights, trademarks, machinery and equipment. The public sale, conducted by Joseph P. Day, brought a final bid of twice the original offer for the properties. Company officials said production and employment at the properties would not be affected by the sale.



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CAPS — Straight wound paper cores made in sizes from 2" to 10" inside diameter with any thickness wall required.

Long draw protected slot caps of heavy gauge steel in all standard sizes.

Heavy duty caps with reenforced square hole. This new patented feature of reenforcement gives added strength and durability. — **CORES**

Samples of caps or cores will be gladly submitted

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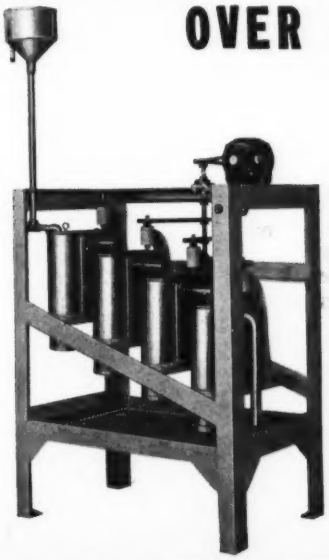

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- Gives precise and accurate data for control work.
- Used by mills in all branches of the industry.
- Designed and built for long-time, convenient, and trouble-free operation.

Write for full details today

THE BAUER BROS. CO.
Springfield, Ohio

The BAUER CLASSIFIER

MISCELLANEOUS MARKETS

Office of the PAPER TRADE JOURNAL,
Tuesday, December 31, 1940.

BLANC FIXE—Quotations on blanc fixe are firm and continue unchanged at prevailing market levels. Demand reported fair for the week. The pulp is currently quoted at $35 per ton, in barrels, at works; the powder is offered at $50 per ton, f.o.b., works.

BLEACHING POWDER—Prices on bleaching powder are firm with demand reported moderate for the week. Bleaching powder is currently quoted at $2 per 100 pounds, in drums at works.

CASEIN—Quotations on casein are reported firm. Demand moderate for the week. Standard domestic casein, 20-30 mesh, is currently quoted at 13 cents per pound; 80-100 mesh, at 13½ cents per pound; all prices in bags, car lots. Standard Argentina casein is currently offered at 12½ cents per pound. No quotations on French casein.

CAUSTIC SODA—Prices on caustic soda are firm and unchanged. Shipments continue in steady volume. Solid caustic soda is currently quoted at $2.30 per 100 pounds; flake and ground at $2.70 per 100 pounds, in drums, at works.

CHINA CLAY—Quotations on china clay are firm and continue unchanged. Domestic filler clay is currently quoted at from $7.50 to $15 per ton; coating clay at from $12 to $22 per ton at mines. Imported clay is quoted at from $13 to $25 per long ton, ship side.

CHLORINE—The demand for chlorine is reported good. Prices are firm and the market strong for the current week. Chlorine is currently quoted at $1.75 per 100 pounds, in single-unit tank cars, f.o.b., works.

ROSIN—The rosin market is reported firm for the week. "G" gum rosin is currently quoted at $1.64 per 100 pounds, in barrels, Savannah. "FF" wood rosin is currently quoted at $1.47 per 100 pounds, in barrels, New York. Seventy per cent gum rosin size is quoted at $2.39 per 100 pounds, f.o.b., works.

SALT CAKE—Prices on salt cake are firm under a steady demand with current quotations continuing nominal. Domestic salt cake is currently quoted at $17 per ton in bulk; chrome salt cake at $16 per ton. All prices in car lots, f.o.b., shipping point. The quotation of $16.50 per ton on imported salt cake continues nominal.

SODA ASH—Quotations on soda ash are firm and continue to conform to prevailing market quotations. Demand reported moderate. Quotations on soda ash in car lots, per 100 pounds, are as follows: in bulk, $.90; in paper bags, $1.05; and in barrels, $1.35.

STARCH—Prices on corn starch are reported firm and continue unchanged for the current week. Pearl is currently quoted at $2.95 per 100 pounds; powdered starch at $3.05 per 100 pounds; all prices in bags, car lots, f.o.b., Chicago.

SULPHATE OF ALUMINA—Quotations on sulphate of alumina are firm. Demand reported moderate for the week. The commercial grades are currently quoted at $1.15 per 100 pounds; iron free at $1.60 per 100 pounds, in bags, car lots, f.o.b., works.

SULPHUR—Prices on sulphur are firm and continue to conform to prevailing market quotations. Annual contracts are currently quoted at $16 per long ton, f.o.b., mines. Spot and nearby car lots are quoted at $19 per ton

TALC—Quotations on talc are firm and continue unchanged at prevailing market prices. Domestic talc is currently quoted at from $15 to $21 per ton, at mills. No quotations on imported talc.

MARKET QUOTATIONS

Paper

(Delivered New York)

News, per ton—			
Roll, contract	$50.00	@	—
Sheets	58.00		
Kraft—per cwt.—Delivered Zone A			
Northern, Extra Quality	$5.25	@	$5.75
Superstandard	4.87½	"	5.25
Northern Standard Wrapping	4.37½	"	4.62½
Standard Wrapping	4.25	"	—
Tissues—Per Ream—Carlots			
White No. 1	.97½	"	—
White No. 1 M. G.	.95	"	—
White No. 1½	.80	"	—
White No. 2	.75	"	—
Anti-Tarnish M. G.	.80	"	—
Colored	.85	"	—
Kraft	.87½	"	—
Manila	.77½	"	—
Unbl. Toilet, 1 M.	3.75	"	—
Bleached Toilet	5.26	"	—
Paper Towels, Per Case—			
Unbleached, Jr.	2.10	"	—
Bleached, Jr.	3.60	"	—
Manila—per cwt.—C. l. f. a.			
No. 1 Jute	8.25	@	10.25
No. 1 Manila Wrapping, 35 lb.	5.25	"	—
No. 2 Manila Wrapping, 35 lb.	5.00	"	—
Boards, per ton—			
News	35.00	@	40.00
Chip	35.00	"	40.00
Sgl. Mla. Ll. Chip	52.50	"	55.00
White Pat. Coated	65.00	"	67.50
Kraft Liners	55.00	"	—
Binders Boards	73.00	"	80.00

The following are representative of distributors' resale prices:

Rag Content Bonds and Ledgers—White, Assorted Items, Delivered in Zone 1:

	Bonds	Ledgers
100% Rag Ext. No. 1.	$39.10@$46.00	$40.25@$47.25
100% Rag	31.05 " 36.50	32.20 " 37.75
85% Rag	.... "	29.90 " 35.00
75% Rag	23.60 " 27.75	24.75 " 29.00
65% Rag	.... "	21.65 " 26.25
50% Rag	17.55 " 21.50	18.70 " 22.75
25% Rag	14.65 " 17.75	15.80 " 19.25

Colors at $1.00 cwt. extra.

Sulphite Bonds and Ledgers—White, Assorted Items, Delivered in Zone 1:

	Bonds	Ledgers
No. 1	$9.35@$11.50	$11.55@$12.75
No. 2	8.50 " 10.25	9.65 " 11.75
No. 3	8.05 " 9.25	9.20 " 11.25
No. 4	7.70 " 9.50	8.90 " 10.75

Colors $1.00 cwt. extra.

Free Sheet Book Papers—White, Cased Paper, Delivered in Zone 1:

No. 1 Glossy Coated	$11.90@$13.50
No. 2 Glossy Coated	10.35 " 11.75
No. 3 Glossy Coated	9.55 " 11.00
No. 4 Glossy Coated	9.15 " 10.50
No. 1 Antique (watermarked)	9.05 "$10.50
No. 2 Offset	8.40 " 9.75
A Grade E. F.	8.20 " 9.50
A Grade S. & S. C.	8.45 " 9.75
B Grade E. F.	7.65 " 8.75
B Grade S. & S. C.	7.90 " 9.00
C Grade E. F.	7.35 " 8.50
C Grade S. & S. C.	7.60 " 8.75
D Grade E. F.	7.10 " 8.25
D Grade S. & S. C.	7.35 " 8.50

Ivory & India at $.50 cwt. extra

Mechanical Pulp

(On Dock, Atlanta Ports)

No. 1 Imported—	
Moist	No prices
Dry	No prices

(Delivered)

No. 1 Domestic and Canadian	40.00	@	42.00

Chemical Pulp

(On Dock, Atlantic, Gulf and West Coast Ports)

Bleached Sulphite (Domestic and Foreign)—			
Prime Bleached Sulphite	3.72½	@	3.87½
Prime Qualities—			
Easy-Bleaching Sulphite	3.17½	"	3.75
Strong Unbleached Sulphite	3.17½	"	3.75
News Grade, delivered			
Unbleached Sulphite	58.00	"	63.75

(On Dock, Atlantic Ports)

Kraft Bleached	4.12½	"	
Kraft Light & Strong	3.50	"	3.90
Kraft No. 1	3.40	"	3.80

(F. o. b. Pulp Mill)

Kraft Domestic and Canadian	2.75	"	3.37½

(Delivered)

Soda Bleached	3.30	"	—

Add 60 cents per short ton, dock charges for Albany; $2.50 for Lake Ports East and $3.50 for Lake Ports West of Mackinac Straits.

Domestic Rags

New Rags

(Prices to Mill f. o. b. N. Y.

Shirt Cuttings—			
New White, No. 1.	6.50	@	6.75
Silesias No. 1	4.50	"	4.65
New Unbleached	6.25	"	6.50
Blue Overall	4.15	"	4.50
Fancy	3.25	"	3.50
Washables	2.00	"	2.15
Mixed Khaki Cuttings	2.75	"	3.00
O. D. Khaki Cuttings	3.00	"	3.15

Old Rags

White, No. 1—			
Repacked	3.50	"	3.63
Miscellaneous	2.75	"	3.00
White, No. 2—			
Repacked	2.50	"	2.73
Miscellaneous	2.00	"	2.25
Thirds and Blues—			
Repacked	1.50	"	1.65
Miscellaneous	1.10	"	1.25
Roofing Rags—			
No. 1	1.15	"	1.20
No. 2	1.00	"	1.05
No. 3 (bagging)	.90	"	1.00
No. 4	.60	"	.65
No. 5A	.60	"	.65

Foreign Rags

All prices nominal

New Rags

New Dark Cuttings	2.25	@	2.40
New Mixed Cuttings	2.00	"	2.20
New Light Silesias	5.50	"	5.75
Light Flannelettes	5.50	"	5.75
New White Cuttings	7.00	"	7.50
New Light Oxford	4.00	"	4.50
New Light Prints	3.00	"	3.25

Old Rags

No. 1 White Linens	7.50	"	8.50
No. 2 White Linens	6.50	"	7.50
No. 3 White Linens	4.50	"	—

More than just a TRADE MARK

EXCELSIOR Woolen Co. KNOX Camden, Me. FELTS & JACKETS

BUT also a guarantee by men who for 75 years have prided themselves in making finer felts. TO YOU —this is the mark of dependability, longer felt life and greater saving.

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CAMDEN, MAINE.

PRICE & PIERCE, LTD

Wood Pulp & Paper Agents

60 East 42nd Street New York City

KALAMAZOO

TILE CHEST

Adapted for Use with Agi-flo Pump

The Shartle Agi-flo agitates and delivers the stock. The Kalamazoo Glazed Tile Chest gives you the advantages of low cost storage and the utmost in cleanliness.

More than 700 installations of Kalamazoo Glazed Tile Tanks now in use prove their unvarying dependability. For maximum efficiency plan to use a Kalamazoo Chest with your next Agi-flo, or any other type of agitator.

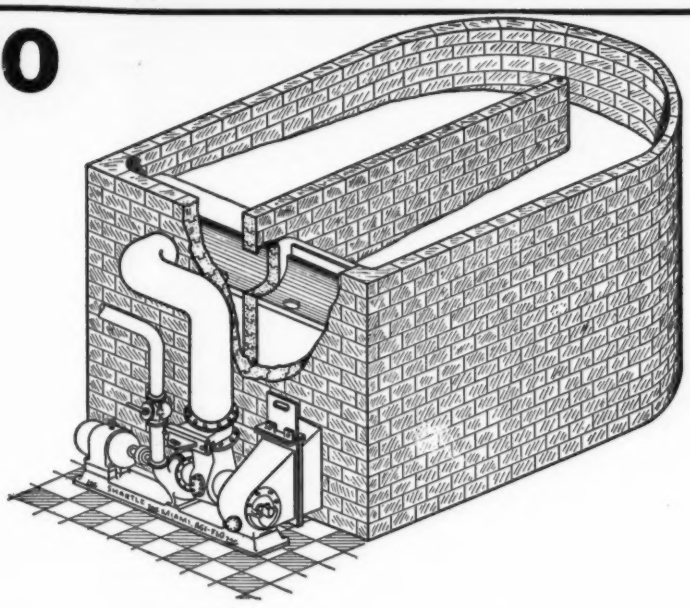

Illustration courtesy of Shartle Brothers Machine Company, manufacturers of the Shartle Agi-flo Pump.

GLAZED TILE

KALAMAZOO TANK & SILO CO.
KALAMAZOO, MICHIGAN

WOOD

No. 4 White Linens	2.25	@	3.25
No. 1 White Cotton	4.25	"	4.75
No. 2 White Cotton	3.25	"	3.75
No. 3 White Cotton	2.50	"	3.00
No. 4 White Cotton	1.90	"	2.20
Extra Light Prints	2.00	"	2.40
Ord. Light Prints	1.75	"	2.15
Med. Light Prints	1.55	"	1.95
Dutch Blue Cottons	2.25	"	2.50
French Blue Linens	3.00	"	—
Checks and Blues	2.00	"	—
Linsey Garments	1.90	"	2.00
Dark Cottons	1.50	"	1.60
Old Shopperies	1.30	"	1.45
New Shopperies	1.45	"	1.50
French Blues	2.25	"	2.50

Old Rope and Bagging

(Prices to Mill, f. o .b. N. Y.)

Gunny No. 1—			
Foreign	Nominal		
Domestic	2.50	"	2.75
Wool Tares, light	2.00	"	2.25
Wool Tares, heavy	2.12½	"	2.25
Bright Bagging	2.25	"	2.50
Manila Rope—			
Foreign	5.25	"	5.50
Domestic	5.25	"	5.50
Jute Threads	2.75	"	3.00
Sisal Strings	2.10	"	2.35
Mixed Strings	1.10	"	1.20

Old Waste Papers

(F. o. b. New York)

Shavings—			
White Envelope Cuttings	3.10	@	3.25
Ordinary Hard White No. 1	2.25	"	2.50
Soft White No. 1	1.80	"	1.90
Soft White Extra	2.50	"	2.60
Flat Stock—			
Stitchless	1.10	"	1.25
Overissue Mag	.90	"	1.00
Solid Flat Book	.80	"	.85
Crumbled No. 1	.70	"	.75
Ledger White Stock	1.70	"	1.75
Ledger Stock Colored	1.30	"	1.40
Manila—			
New Env. Cut	1.70	"	1.80
New Cuttings	1.30	"	1.40
Old Kraft Machine Compressed bales	1.40	"	1.50
News—			
No. 1 White News	1.75	"	1.90
Strictly Overissue	.70	"	.75
Strictly Folded	.45	"	.50
Corrugated	.40	"	.45
No. 1 Mixed Paper	.25	"	.30

Twines

(F. o. b. Mill)

(Soft Fiber)			
Coarse Polished—			
India	.18	@	—
White Hemp	.18	"	—
Fine Polished—			
Fine India	.22	"	—
Unpolished—			
Box	.16	"	—
Paper Makers	.13	"	—
Tube Rope	.14½	"	—
Wall Paper	.16	"	—
Wrapping	.16	"	—
Soft Fiber Rope	.14	"	—
Cotton	.24	"	—
(Hard Fiber)			
Medium Java	.10	"	—
Mex. Sisal	.09½	"	—
Manila	.23	"	—

PHILADELPHIA

Domestic Rags (New)

Price to Mill, f.o.b. Phila.)

Shirt Cuttings—			
New White No. 1	.06½	@	.07
New White No. 2	.03½	"	.04
Light Silesias	—	"	.04½
Silesias, No. 1	—	"	.04
Black Silesias, soft	—	"	.03
New Unbleached	.06	"	.06¼
Washable Prints	.02¼	"	.02½
Washable, No. 1	—	"	.01½
Blue Overall	.04	"	.04½
Cottons—According to grades—			
Washable shredding	—	"	.01½
Fancy Percales	—	"	.03
New Black Soft	.02½	"	.02¾
New Light Seconds	—	"	.04
New Dark Seconds	—	"	1.50
Khaki Cuttings—			
No. 1 O. D.	.03½	"	.03¾
No. 2 Mixed	.01¾	"	.02
Corduroy	.01¾	"	.01½
New Canvas	.04½	"	.05
New Black Mixed	—	"	.02¾

Domestic Rags (Old)

White No. 1—			
Repacked	3.00	@	3.50
Miscellaneous	2.75	"	3.00
Thirds and Blues—			
Miscellaneous	1.35	"	1.50
Repacked	1.55	"	1.65
Black Stockings	3.50	"	4.00
Roofing Stock			
Foreign No. 1	Nominal		
Domestic No. 1	1.10	"	1.15
Domestic No. 2	.95	"	1.00
Roofing Bagging	.85	"	.90

Bagging

(f.o.b. Phila.)

Gunny, No. 1—			
Foreign	Nominal		
Domestic	2.25	@	2.50
Manila Rope	—	"	5.50
Sisal Rope	2.00	"	2.25
Mixed Rope	.75	"	1.00
No. 1	2.55	"	2.75
No. 2	—	"	1.50
Wool Tares, heavy	3.75	"	4.00
New Light Burlap	3.00	"	4.00
New Burlap Cuttings	2.25	"	2.50

Old Papers

(f.o.b Phila.)

Shavings—			
No. 1 Hard White	2.40	@	2.50
No. 2 Hard White	2.10	"	2.15
No. 1 Soft White	1.90	"	2.00
No. 2 Soft White	1.60	"	1.75
No. 1 Mixed	.90	"	1.00
Solid Ledger Stock	1.90	"	2.00
Ledger Stock, white	1.50	"	1.60
Ledger Stock, colored	1.10	"	1.15
No. 1 Books, heavy	.80	"	.85
Manila Cuttings	1.75	"	1.80
Print Manila	.50	"	.55
Container Manila	.40	"	.45
Kraft Paper	1.25	"	1.30
No. 1 Mixed Paper	.25	"	.30
Straw Board Chip	.30	"	.35
Binders Board Chip	.30	"	.35
Corrugated Board	.50	"	.60
Overissue News	.70	"	.75
Old Newspapers	.50	"	.55

BOSTON

Old Papers

(f.o.b. Boston)

Shavings—			
No. 1 Hard White	2.75	@	3.00
No. 1 Soft White	2.00	"	2.25
No. 2 Mixed	.75	"	.80
Solid Ledger Books	1.50	"	1.75
Overissue Ledger Stock	1.75	"	2.00
Mixed Ledgers	1.50	"	1.75
No. 1 Heavy Books	1.10	"	1.20
No. 1 Books, Light	.75	"	.85
Crumpled Stitchless Book Stock	.75	"	.85
Manila Env. Cuttings	1.85	"	2.00
Manila Envelope Cuttings extra quality	2.35	"	2.60
No. 1 News	.30	@	.35
No. 1 Kraft	1.25	"	1.30
Extra No. 1 Kraft	1.00	"	1.65
Mixed Papers			
Print Manila	.55	"	.60
Container Manila	.40		
Old Newspapers	.50	"	.55
Paper Wool Strings	.95	"	1.10
Overissue News	1.00	"	1.10
Box Board Chips	.40	"	.45
Corrugated Boxes	.55	"	.60
Kraft corrugated boxes	.90	"	1.00
New Kraft Corrugated Cuttings	1.45	"	1.60
Screening Wrappers	.70	"	.80

Bagging

(f.o.b. Boston)

Gunny Bagging—			
Foreign	2.70	"	—
Domestic	2.25	"	2.40
Sisal Rope	2.25	"	2.50
Mixed Rope	.85	"	1.00
Transmission Rope—			
Foreign	—	"	2.40
Domestic	2.00	"	2.25
Soft Jute Rope	3.25	"	3.50
Manila Rope—			
Foreign	5.00	"	5.25
Domestic	4.75	"	5.00
Jute Carpet Threads	2.00	"	2.25
Bleachery Burlap	4.00	"	3.25
Scrap Burlap—			
Foreign	2.35	"	2.50
Domestic	2.15	"	2.35
Scrap Sisal	2.25	"	2.50
Scrap Sisal for Shredding	2.30	"	2.65
Wool Tares—			
Foreign, Heavy	2.40	"	2.50
Domestic	2.40	"	2.50
Aust. Wool Pouches	2.75	"	3.00
New Burlap Cuttings	3.75	"	4.00
Heavy baling bagging	2.75	"	3.00
Paper Mill Bagging	1.75	"	2.00
No. 2 Bagging	.75	"	.80

Domestic Rags (New)

(F. o. b. Boston)

Shirt Cuttings—			
New Light Prints	—	@	.03
Fancy Percales	.04	"	.04¼
New White No. 1	.06¾	"	.07
New Light Flannelettes	.05	"	.05¼
Canton Flannel, Bleached	—	"	.06½
Underwear Cutters, Bleached	—	"	.06½
Silesias No. 1	05	"	
New Black Silesias	3.00	"	3.25
Red Cotton Cuttings	.04	"	.05
Soft Unbleached	.07	"	.07½
Blue Cheviots	.05	"	.05½
Fancy	.02	"	.02½
Washable	.02	"	.02½
Cottons—According to Grades—			
Blue Overalls	.04¾	"	.05
New Black, Soft	.03	"	.03½
Khaki Cuttings	.02½	"	.03
O. D. Khaki	.02½	"	.03¾
Corduroy	.02¾	"	.03
New Canvas	.06¼	"	.07½
B. V. D. Cuttings	.07	"	.07½

Domestic Rags (Old)

(F. o.b. Boston)

White No. 1—			
Repacked	2.75	"	3.00
Miscellaneous	2.40	"	2.60
White No. 2—			
Repacked	1.90	"	2.00
Miscellaneous	2.00		
Twos and Blues	2.00	"	2.25
No. One Overalls			
Thirds and Blues	1.50	"	1.75
Miscellaneous	1.25	"	1.35
Black Stockings	3.50	"	4.00
Roofing Stock—			
No. 1	1.20	"	1.30
No. 2	.95	"	1.00
No. 3	.85	"	.95

Foreign Rags

(F. o. b. Boston

Canvas	.04¼	@	—
Dark Cottons	(nominal)		
Dutch Blues	(nominal)		
New Checks and Blues	(nominal)		
Old Fustians	(nominal)		
Old Linsey Garments	(nominal)		
New Silesias	(nominal)		

CHICAGO

Waste Paper

(f.o.b. Chicago)

Shavings—			
No. 1 White Envelope cuttings	3.15	@	—
No. 1 Hard White	2.50	"	2.65
No. 1 Soft White	2.00	"	2.20
Ledger and Writings	.85	"	.95
Solid Books	.95	"	1.10
Blanks	1.50	"	1.60
Krafts	1.40	"	1.50
New Kraft Cuts	1.60	"	1.75
Overissue News	1.00	"	1.10
Old Newspapers—			
No. 1 Folded News	.70	"	.80
No. 1 Mixed Paper	.40	"	.50
Roofing Stocks—			
No. 1	.95	@	1.00
No. 2	.85	"	.90

Buy Paper Under Walsh-Healey Act

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., Dec. 31, 1940—During the week ended December 14, the Government purchased $308,845.29 worth of paper and allied products under the Walsh-Healey Act as follows: $10,746.00 worth of fiber containers for War, Ord., Philadelphia, from Cleveland Container Company, Philadelphia, Pa.; $16,116.79 worth of office supplies for War, Air Corps, from National Container Corporation, Long Island City, N. Y.; $12,880.00 worth wrapping paper for Navy, S&A, from Walker Goulard Plehn Co., Inc., New York City; $14,124.00 worth paper towels for Navy, S&A, from Acme Paper Company, San Francisco, California; $26,030.00 worth stencil paper for War, QMC, Brooklyn, from A. B. Dick Co., Chicago, Ill.; $35,385.00 worth folders for War, QMC, Brooklyn, from Majestic File Folder Corporation, New York City; $26,700.00 worth bond paper for War, QMC, Brooklyn, from R. P. Andrews Paper Co., Washington, D. C.; $11,154.00 worth tracing paper for War, Engineers, D. C., from Charles Bruning Co., Inc., Washington, D. C.; $55,209.50 worth tracing cloth for War, Engineers, D. C., from The Frederick Post Co., Chicago, Ill.; and $100,500.00 worth mimeograph paper for Navy, S&A, from R. P. Andrews Paper Company, Washington, D. C.

Abitibi Newsprint Price Unchanged

[FROM OUR REGULAR CORRESPONDENT]

TORONTO, Ont., December 30, 1940—G. T. Clarkson, receiver and general manager of the Abitibi Power and Paper Company, has announced that Abitibi's domestic base price for newsprint would remain at $50 a ton, prepaid, until June, 1941.